

Classification: Not classified.

**EMI Test Procedure
for MILES 2000 MGSS & DIFCUE
- Keyless System -**

DOCUMENT NO. 9718801
ISSUE 1.2
20.07.98

Prepared Under Contract # N61339-95-C-0033
for the US Army Simulation Training and Instrumentation Command

SDRL # A018-002

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

RELEASE NOTE**Prepared:**

(DLE-QE):

.....

Dept.	Date	Signature
-------	------	-----------

Configuration Mgmt:

(DLE-SZ):

.....

Dept.	Date	Signature
-------	------	-----------

Released:

DLE-Q):

.....

Dept.	Date	Signature
-------	------	-----------

Approved:

Issue	1.0	1.1	1.2										
Date	07.07.97	20.11.97	20.07.98										

List of active pages:

Page	i	ii	iii	iv	1-48														
Index	-	-	-	-	-														
Page																			
Index																			
Page																			
Index																			
Page																			
Index																			

INDEX	-					DOC.NO.	ISSUE	DATE	NAME
DATE	-					9718801	1.2	20.07.98	-

CONTENTS

RELEASE NOTE	ii
REVISIONS	iii
CONTENTS	iv
0.Related Documents	1
0. 1.Acronyms and Abbreviations	1
1.General	2
1. 1.Introduction	2
1. 1. 1.DIFCUE System.....	2
1. 1. 2.MGSS System	2
1. 2.Test / Similarity Matrix.....	3
1. 3.Test Facility Description.....	3
1. 3. 1.Calibration Requirements of Test and Measurement Equipment.....	3
1. 3. 2.Instrument Operation	4
1. 3. 3.Measurement Instrument Grounding.....	4
1. 3. 4.Current Probe	4
1. 3. 5.Antennas.....	4
1. 3. 6.Accuracy of Measurement	4
1. 3. 7.Test Facility Arrangements	4
2.Test procedures.....	6
2. 1.Radiated Emissions Test.....	6
2. 2.Conducted Emissions Test.....	14
2. 3.Radiated Susceptibility Test.....	20
2. 4.Conducted Susceptibility Test.....	25
2. 5.Personnel Electrostatic Discharge Test.....	30
2. 6.Voltage Spikes and Surges Test	31
2. 7.EMRH Test	38
2. 8.EMRO Test	38
3.Tests	39
3. 1.Functional Test	39
3. 1. 1.DIFCUE.....	39
3. 1. 2.MGSS	42
4.Appendix	44

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

0. RELATED DOCUMENTS

- [1] Specification AMSTI-93-S026 Performance Specification for the Main Gun Signature Simulator (MGSS) Device Number 17-180 dated 8 February, 1994, incl. Mod P00013.
- [2] Specification AMSTI-93-S027 Performance Specification for the Direct / Indirect Fire Cue (DIFCUE) Device Number 06-69 dated, 1 April 1994, incl. Mod P00013.
- [3] Critical Item Development Specification for Audio / Visual Cue Pyrotechnic Simulator 19200-DS-138 dated 1 April, 1994, incl. Mod P00013.
- [4] MIL-STD-810E, Notice 1, Environmental Test Methods and Engineering Guidelines dated July 14, 1989.
- [5] Environmental Test Procedure for MILES2000 MGSS & DIFCUE -Keyless System- Diehl document 9718802 (SDRL #A014-002).
- [6] Acceptance Test Procedure for MILES2000 MGSS & DIFCUE -Keyless System- Diehl document 9719201
- [7] MIL-STD-331B, Fuze and Fuze Components, Environmental and Performance Tests for.
- [8] MIL-STD-461D, Requirements for Control of Electromagnetic Interference Emissions and Susceptibility.
- [9] MIL-STD462D, Electromagnetic Interference Characteristics, Measurement of.
- [10] MIL-STD-1275A, Characteristics of 28 Volt DC Electrical Systems in Military Vehicles.
- [11] Test Operations Procedure (TOP) 1-2-511, Intersystem Electromagnetic Compatibility Requirements dated 29 December 1989.
- [12] MIL-I-45208 „Inspection System requirements“
- [13] MIL-STD-45662 „Calibration System Requirements“

0. 1. Acronyms and Abbreviations

AVCPS	Audio / Visual Cue Pyrotechnic Simulator
DC	Direct current
DIFCUE	Direct / Indirect Fire Cue
EED	Electric Explosive Device
EMRH	Electromagnetic Radiation, Hazard
EMRO	Electromagnetic Radiation, Operational
FCU	Fire Control Unit
FU	Firing Unit
MGSS	Main Gun Signature Simulator
UUT	Unit under test

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

1. GENERAL

This document describes the procedures that apply for the Pre-Production Qualification Testing of the MILES 2000 MGSS and DIFCUE.

1. 1. Introduction**1. 1. 1. DIFCUE System**

The DIFCUE system consists of:

- 1 DIFCUE Firing Unit (FU), P/N 148770-2
- 1 DIFCUE Fire Control Unit (FCU), P/N 148731-2
- 1 Cable Assy, FCU/FIRING UNIT, DIFCUE, P/N 148768-1
- 1 DIFCUE Trigger Cable P/N 146450-1
- 1 Cable Assy, DC Power, MGSS/DIFCUE, P/N 148765-1
- Fastener Tape for FCU

The trigger cable used shall be adapted to the test setup.

The power supply cable used shall be adapted to the test setup.

The Direct / Indirect Fire Cue (DIFCUE) shall simulate both direct fire vehicle kill and incoming artillery during force-on-force training exercises. The DIFCUE shall provide a minimum of 30 shot capability and shall simulate the flash, smoke, and noise of a direct fire kill and incoming artillery explosion. The DIFCUE will be used in conjunction with the Multiple Integrated Laser Engagement System 2000 (MILES 2000), Tactical Engagement Simulation (TES) System for direct fire kill and the Simulated Area Weapons Effects/Multiple Integrated Laser Engagement System II - Vehicle Detection Device (SAWE/MILES II - VDD) for incoming artillery.

Operating voltage	16 VDC - 31 VDC
Current consumption	300 mA (Armed mode, no firing) 5 A - 7 A (firing pulse)
Internal frequencies	4 MHz quartz oscillator for CPU 455 kHz quartz oscillator

1. 1. 2. MGSS System

The MGSS system consists of:

- 1 MGSS Firing Unit (FU), P/N 149105-2
- 1 MGSS Fire Control Unit (FCU), P/N 149101-2
- 1 Cable Assy, FCU/FIRING UNIT, MGSS, P/N 149104-1
- 1 MGSS Trigger Cable P/N 146 452-1
- 1 Cable Assy, DC Power, MGSS/DIFCUE P/N 148765-1
- Fastener Tape for FCU

The power supply cable and the trigger cable shall be adapted to the test setup.

The Main Gun Signature Simulator (MGSS) shall simulate main gun fire of armor vehicles during force-on-force training exercises. The MGSS shall provide a minimum of 60 shot capability and shall simulate the

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

flash, smoke, and noise created when an armor vehicle main gun fires. The MGSS will be used in conjunction with the Multiple Integrated Laser Engagement System 2000 (MILES 2000) Tactical Engagement Simulation (TES) System.

Operating voltage 16 VDC - 31 VDC
 Current consumption 100 mA (Armed mode, no firing)
 5 A - 7 A (firing pulse)
 Internal frequencies 4 MHz quartz oscillator for CPU

1. 2. Test / Similarity Matrix

Table 1. -1.

	MGSS	DIFCUE
EMI		
2. 1. Radiated Emissions Test	Test	Test
2. 2. Conducted Emissions Test	Test	Test
2. 3. Radiated Susceptibility Test	Test	Test
2. 4. Conducted Susceptibility Test	Test	Test
2. 5. Electrostatic Discharge Test	Test	Test
2. 6. Voltage Spikes and Surges Test	Test	Test
2. 7. EMRH Test	Test	Test
2. 8. EMRO Test	Test	Test

1. 3. Test Facility Description

1. 3. 1. Calibration Requirements of Test and Measurement Equipment

The calibration and accuracy of all measuring and test equipment shall comply with the requirements of MIL-I-45208, „Inspection System Requirements“ and MIL-STD-45662, „Calibration System Requirements“.

The calibration laboratory control standards shall be traceable to those maintained by the National Institute of Standards Technology (NIST) or a national government authority of standards.

All instruments used in the performance of the tests described herein shall be calibrated as recommended by the manufacturer and as required by MIL-STD-45662A and/or MIL-STD-461D. The EMI test engineer shall verify that all instruments are in calibration during their use. The date of last calibration for each instrument used shall be recorded at the time of use and reported in the EMI test report.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

1. 3. 2. Instrument Operation

Interference measuring instrument operation and calibration shall be in accordance with the test specification and the manufacturers recommendations. In the event of conflict, the test procedure shall take precedence except as otherwise noted. Meters shall be operated in the peak mode for all measurements. The instruments are direct meter reading.

1. 3. 3. Measurement Instrument Grounding

The interference measuring instruments shall be physically grounded with only one connection at all times and the antenna shall be isolated from the EMI meter, if possible.

The EMI meter shall be grounded to the ground plane with a copper bond strap having a length to width ratio of 5 to 1 respectively for measurements of conducted and radiated interference except while making radiated measurements with the monopole antenna, then the counterpoise of the antenna shall be bonded to the ground plane and the EMI meter isolated from the ground. During all measurements the EMI meter shall be isolated from power ground via an isolation transformer.

1. 3. 4. Current Probe

The current probe transfer impedance curve, which shall be used for conducted emissions tests, is included in fig. 1-2 (TBD).

1. 3. 5. Antennas

The antenna factor curves and tabulated table, which shall be used for radiated emissions tests, are shown in fig. 1-3 (TBD).

1. 3. 6. Accuracy of Measurement

The expected accuracy of measurement shall be:

Frequency Accuracy: $\pm 2 \%$
 Amplitude Accuracy: $\pm 2 \text{ dB}$
 Distance: $\pm 5 \%$
 Amplitude, Measurement System
 (includes measurement receivers, transducers, cables etc):
 $\pm 3 \text{ dB}$
 Time (waveforms): $\pm 5 \%$

1. 3. 7. Test Facility Arrangements

The test facility arrangements, room locations, shieldings are shown in fig. 1-1.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

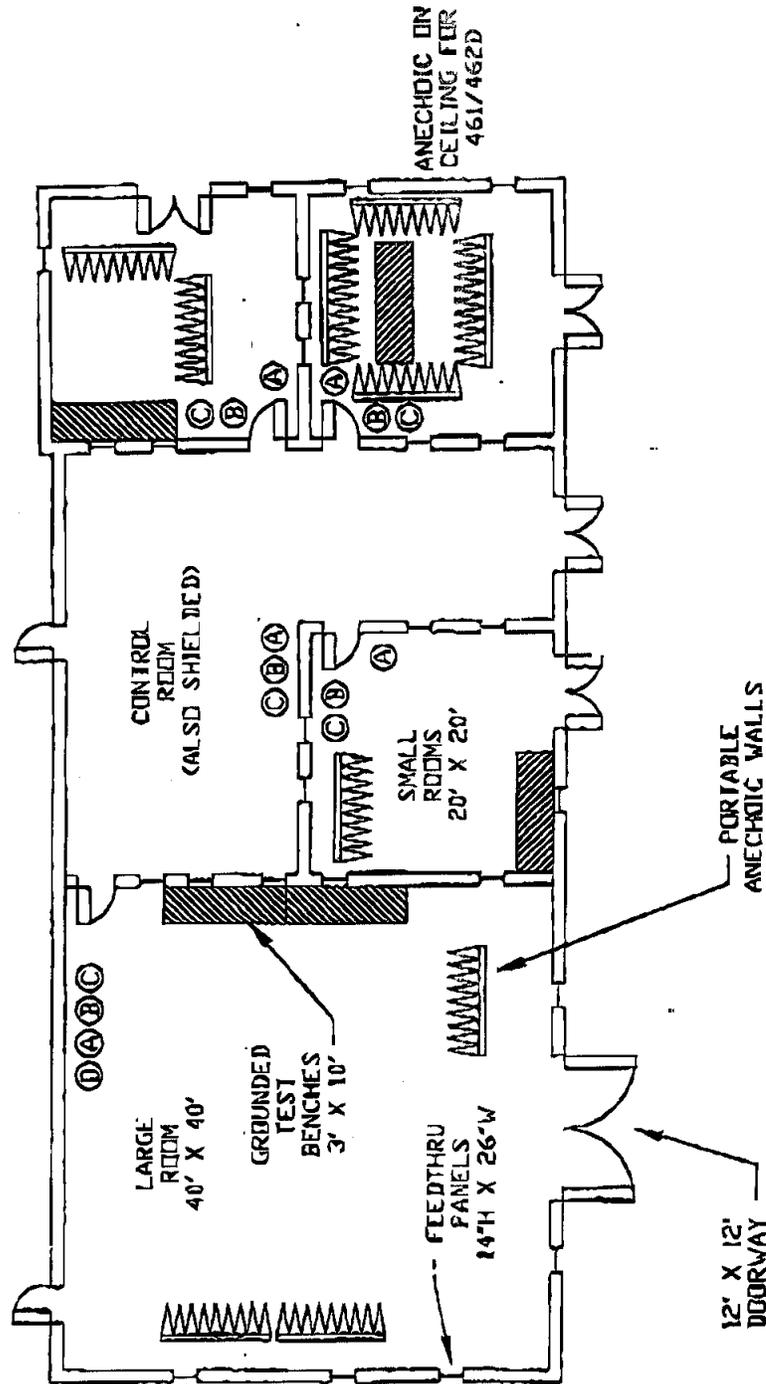


Figure 1. -1. Test facility arrangements.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

2. TEST PROCEDURES**2. 1. Radiated Emissions Test**

Test reference:	Specification paragraph [1] 4.7.2.6.11.2 Specification paragraph [2] 4.7.2.6.11.2
Test method:	According to MIL-STD-462, method RE102, and MIL-STD-461 RE102.
Test samples:	DIFCUE (FU 148770-2 and FCU 148731-2), MGSS (FU 149105-2 and FCU 149101-2), Trigger cable 146 450-1 (DIFCUE), 146 452-1 (MGSS) Interconnection cable 148768-1 (305 390) (DIFCUE), 149104-1 (305 120) (MGSS) Power cable 148765-1 (305 370)
Test duration:	3 days
Test conditions:	UUT powered up, equipped with inert pyrotechnics with optical indicators. Ambient temperature and humidity conditions.
Test circuit:	See figure 2-3.
Test setup:	See figure 2-1.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Test equipment: See table 2-1.

Table 2. -1.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC supply 28 V / 7.5 A (or variable output)	1	EA 7030-200	N/A	Eltronix
2	Spectrum analyzer 20 Hz - 22 GHz	1	8566B	N/A	HP
3	Recording device (Plotter)	1	7090A	N/A	HP
4	Data Acquisition System	1	9000	N/A	HP
5	Signal generator 1 Hz - 13 MHz	1	3312A	N/A	HP
6	Signal generator 10 MHz - 60 GHz	1	8673D	N/A	HP
7	Antenna, rod, 41 '' 10 kHz - 32 MHz, 0 dB	1	94592-1	N/A	Eaton
8	Antenna, biconical, 20 MHz - 200 MHz	1	94455-1	N/A	Eaton
9	Antenna, double ridge horn, 200 MHz - 1 GHz	1	3100	N/A	EMCO
10	Antenna, double ridge horn, 1 GHz - 18 GHz	1	3115	N/A	EMCO
11	LISN 10 kHz - 50 MHz	2	9233-50-TS-50-N	N/A	Solar
12	Ground plane, copper, 250 cm x 80 cm min.	1	N/A	N/A	EMCC
13	Trigger generator	1	N/A	149029-1 (EP4-104-97)	Diehl
14	Trigger cable, DIFCUE	1	N/A	146450-1	CDS
15	Trigger cable, MGSS	1	N/A	146452-1	CDS
16	Pyrotechnic, inert, with optical indicator, DIFCUE	10	N/A	149041-1	Diehl
17	Pyrotechnic, inert, with optical indicator, MGSS	10	N/A	149041-2	Diehl

Pyrotechnic, inert, with optical indicator:

Polyethylene body with contacts. The optical indicator consists of a 1 Ohm wire wound resistor and a 6V / 50 mA incandescent lamp connected in parallel to the pyrotechnic contacts.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

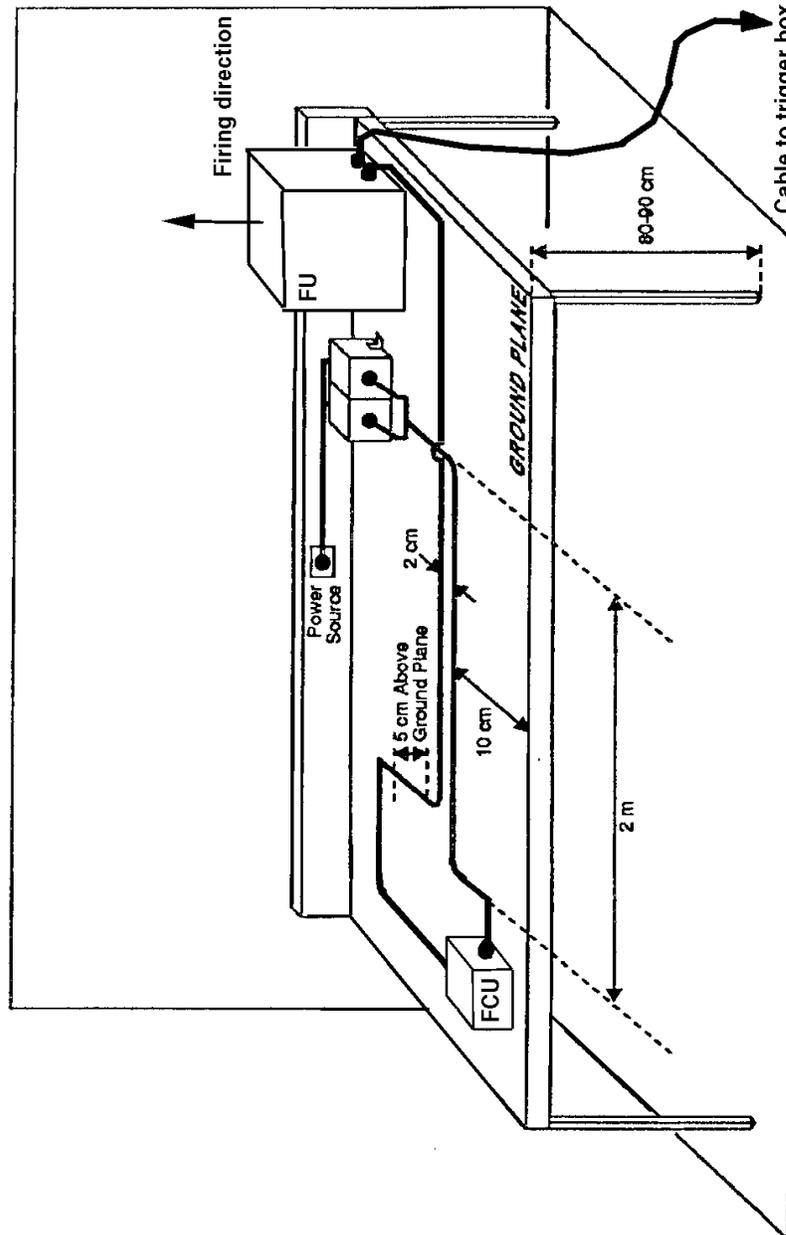
Test procedure:

- a) Verify Acceptance Test Report is complete.
- b) Establish the system setup so that the Functional Test can be conducted (see figure 3-1 for DIFCUE, figure 3-2 for MGSS).
- c) Perform the functional test according to paragraph 3.1
- d) Switch UUT to safe mode.
- e) Load the Firing Unit with 10 inert pyrotechnics with optical indicator as shown in figure 3-1 (DIFCUE) and figure 3-2 (MGSS).
- f) Establish the system check setup according to figure 2-2.
- g) Ensure, that the ambient electromagnetic level measured with the UUT de-energized and all test equipment turned on is at least 6 dB below the allowable limits in figure 2-5.
- h) Perform an evaluation of the overall measurement system:
 - Adjust the signal generator and apply the calibrated signal level to the coaxial cable at the antenna connection point:
30 MHz / 18 dB μ V/m,
200 MHz / 24 dB μ V/m,
18 GHz / 63 dB μ V/m
 - Scan the measurement receiver and verify that data recording device indicates a level within ± 3 dB of the injected signal level.
- i) If readings are obtained which deviate by more than ± 3 dB, locate the source of the error and correct the deficiency prior to proceeding with step j).
- j) Establish the test setup according to figure 2-3 and 2-4.
- k) Adjust the power supply voltage to 28 V \pm 1 V, and switch it on.
- l) Switch UUT on in armed mode (FU safe wheel to ARMED, FCU switch to ARMED).
- m) *Normal mode*
Scan the measurement receiver over the frequency range 2 MHz to 18 GHz.
The minimum sweep time is 100 seconds per decade.
Use antennas and polarizations as listed in table 2-2.
The bandwidth of the receiver shall be as follows:
2 MHz - 30 MHz: B = 10 kHz (at -6 dB)
30 MHz - 1 GHz: B = 100 kHz (at -6 dB)
2 GHz - 18 GHz: B = 1 MHz (at -6 dB).
- n) *Firing mode*
Set the measurement receiver to 1 MHz, 5 MHz, 10 MHz (bandwidth B = 10 kHz [at -6 dB]).
Record the maximum emissions at the frequencies listed when a trigger signal is initiated to activate an ignition of a pyrotechnic.
Verify activation of pyrotechnic by the optical indicator. The indicator shall momentarily light up when the pyrotechnic is activated.
After activation of the highest loaded position, the FCU must be switched to safe mode, then back to armed mode, to restart the system.
- o) Switch the UUT off and disconnect the FU and the FCU from the test setup.
- p) Perform the functional test according to paragraph 3.1

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Test evaluation: Radiated emissions shall not exceed the values shown on figure 2-5 over the required test frequencies.

Data Sheets: Use Data sheets as per Appendix 4.
Data plots shall be appended to the data sheets.



Note: The test setup has to be established in an RF shielded room.

Figure 2. -1. General test setup.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

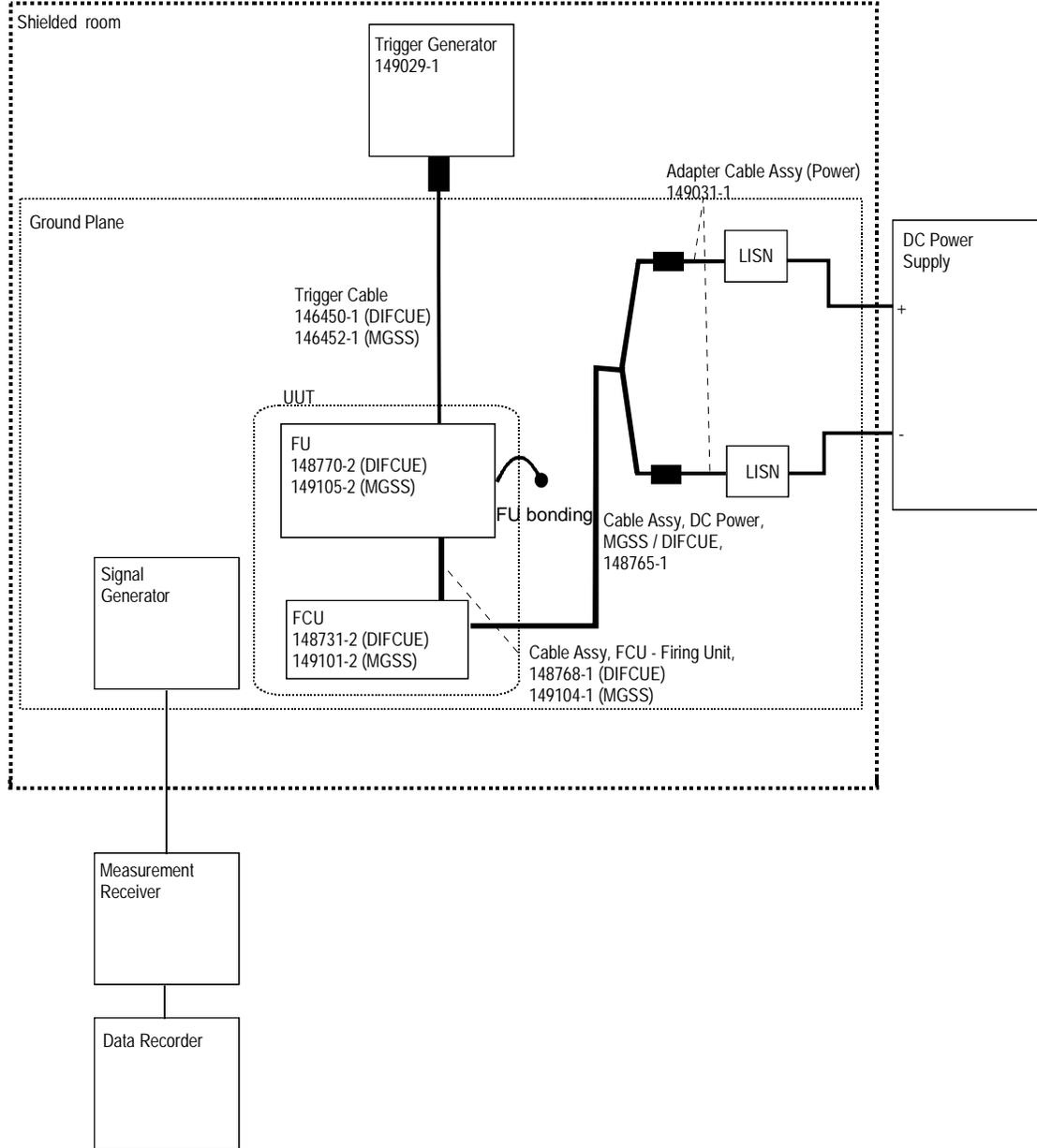
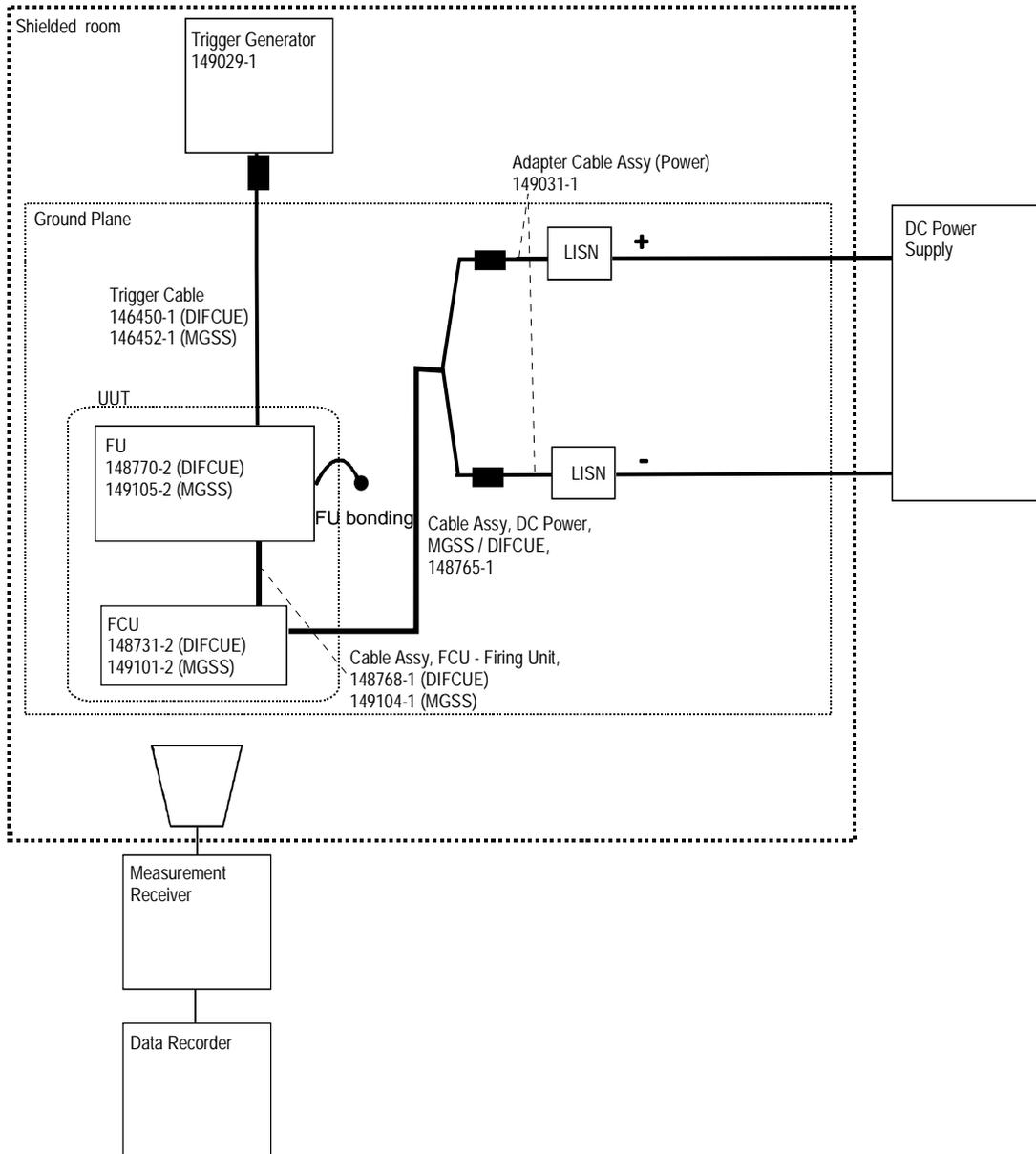


Figure 2. -2. Radiated emissions system check setup.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-



The FCU shall be isolated from the ground plane and attached to it with Velcro tape.
The FU is bonded to the ground plane by a bonding cable.
Two meters of the interconnecting cable shall run in parallel to the front boundary.

Figure 2. -3. Radiated emissions test setup.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Table 2. -2. Antenna selection.

Frequency	Antenna type	Polarization
2 MHz - 30 MHz	104 cm rod with square counterpoise minimum 60 cm x 60 cm	vertical
30 MHz - 200 MHz	biconical antenna, 137 cm tip to tip	vertical and horizontal
200 MHz - 18 GHz	double ridge horns	vertical and horizontal

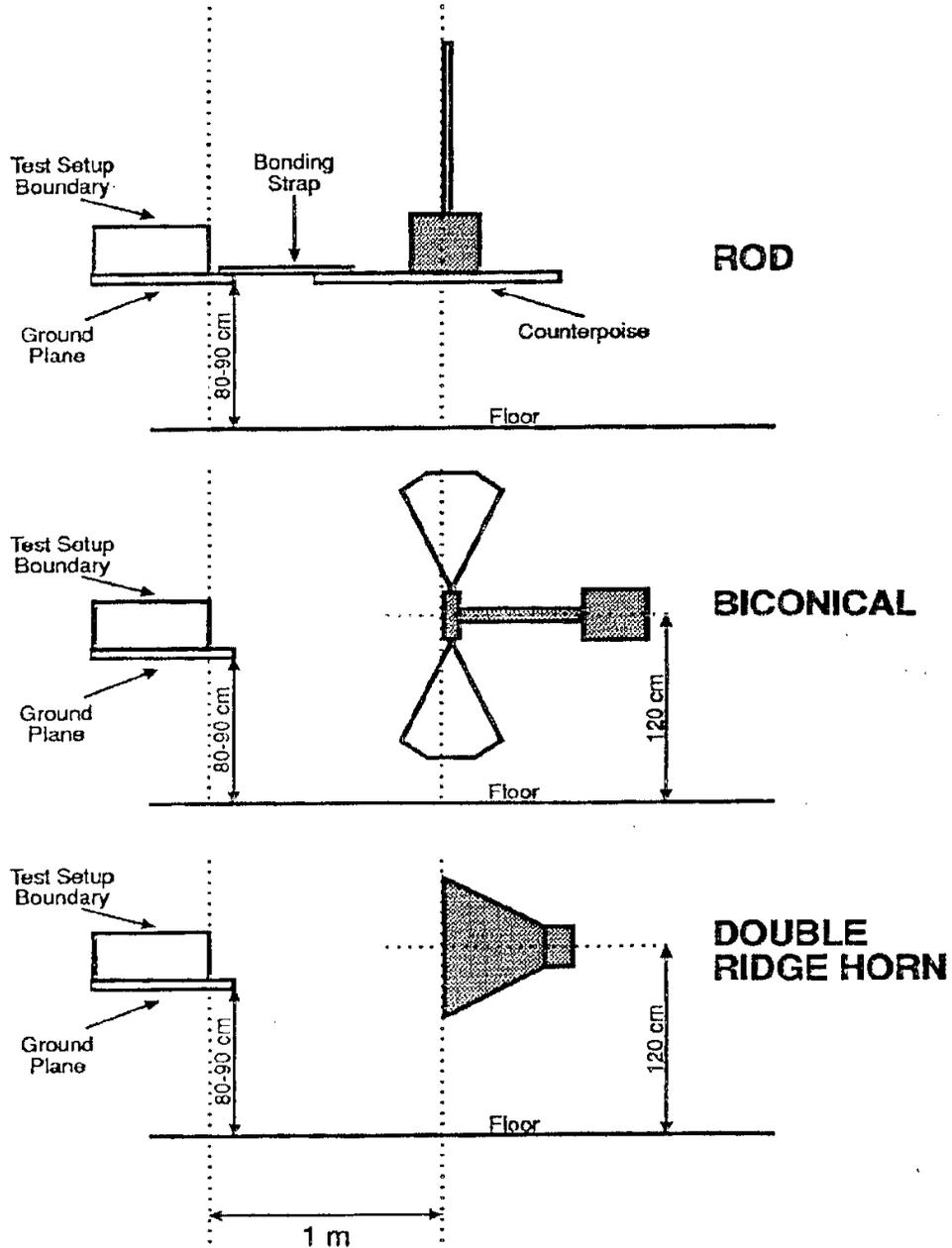
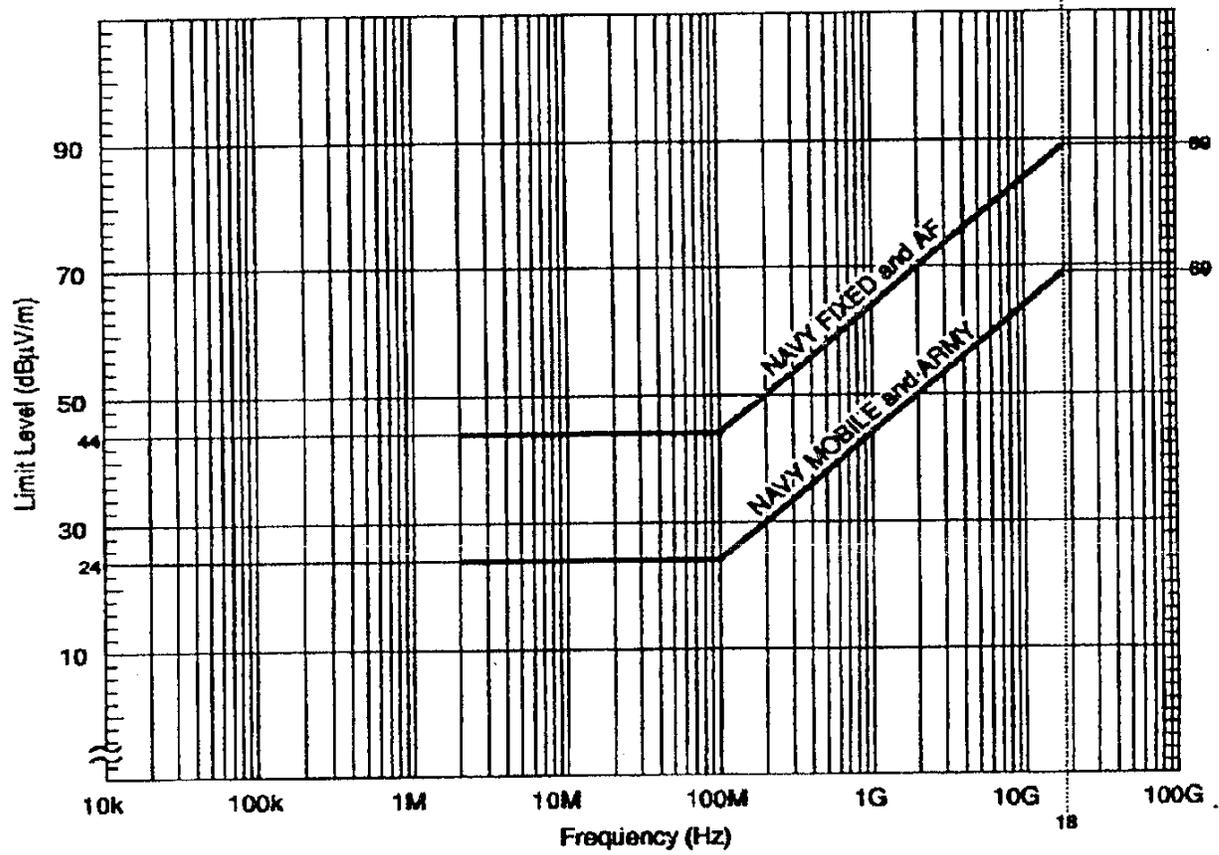


Figure 2. -4. Antenna positioning for radiated emissions test.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-



„NAVY MOBILE and ARMY“ curve applies.

Figure 2. -5. Radiated emission limits.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

2. 2. Conducted Emissions Test

Test reference:	Specification paragraph [1] 4.7.2.6.11.4 Specification paragraph [2] 4.7.2.6.11.4
Test method:	According to MIL-STD-462, method CE102, power leads, and MIL-STD-461 CE102.
Test samples:	DIFCUE (FU 148770-2 and FCU 148731-2), MGSS (FU 149105-2 and FCU 149101-2), Trigger cable 146 450-1 (DIFCUE), 146 452-1 (MGSS) Interconnection cable 148768-1 (305 390) (DIFCUE), 149104-1 (305 120) (MGSS) Power cable 148765-1 (305 370)
Test duration:	1 day
Test conditions:	UUT powered up, equipped with inert pyrotechnics with optical indicators. Ambient temperature and humidity conditions.
Test circuit:	See figure 2-7.
Test setup:	See figure 2-1.
Test equipment:	See table 2-3.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Table 2. -3.

Item #	Function	Quantity req'd	Model number	Part number	Manufacturer
1	DC supply 28 V / 7.5 A (or variable output)	1	EA 7030-200	N/A	Eltronix
2	Spectrum analyzer 20 Hz - 22 GHz	1	8566B	N/A	HP
3	Recording device (Plotter)	1	7090A	N/A	HP
4	Signal generator 10 Hz - 13 MHz	1	3312A	N/A	HP
5	Attenuator, 20 dB	1	CN-409/UPM-84	N/A	Polarad
6	Oscilloscope 500 MHz bandwidth	1	TDS-520	N/A	Tektronix
7	LISN 10 kHz - 50 MHz	2	9233-50-TS-50-N	N/A	Solar
8	Attenuator 10 Hz - 50 MHz	1	432D	N/A	Key Elemetrics
9	Data acquisition system	1	9000	N/A	HP
10	Ground plane, copper, 250 cm x 80 cm min.	1	N/A	N/A	EMCC
11	Trigger generator	1	N/A	149029-1 (EP4-104-97)	Diehl
12	Trigger cable, DIFCUE	1	N/A	146450-1	CDS
13	Trigger cable, MGSS	1	N/A	146452-1	CDS
14	Pyrotechnic, inert, with optical indicator, DIFCUE	10	N/A	149041-1	Diehl
15	Pyrotechnic, inert, with optical indicator, MGSS	10	N/A	149041-2	Diehl

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Test procedure:

- a) Verify Acceptance Test Report is complete.
- b) Establish the system setup so that the Functional Test can be conducted (see figure 3-1 for DIFCUE, figure 3-2 for MGSS).
- c) Perform the functional test according to paragraph 3.1
- d) Switch UUT to safe mode.
- e) Load the Firing Unit with 10 inert pyrotechnics with optical indicator as shown in figure 3-1 (DIFCUE) and figure 3-2 (MGSS).
- f) Establish the calibration setup according to figure 2-6.
- g) Set the signal generator to the test frequency $f_1 = 10 \text{ kHz}$, the output level to $88 \text{ dB}\mu\text{V}$. Verify the output waveform is sinusoidal.
- h) Verify that the measurement receiver indicates a level within $\pm 3 \text{ dB}$ of the injected level. Correction factors shall be applied for the 20 dB attenuator and the voltage drop due to the LISN coupling capacitor.
- i) Repeat steps g) and h) for the frequencies / output voltages as listed below:
 $f_2 = 100 \text{ kHz} / 68 \text{ dB}\mu\text{V}$
 $f_3 = 2 \text{ MHz} / 54 \text{ dB}\mu\text{V}$
 $f_4 = 10 \text{ MHz} / 54 \text{ dB}\mu\text{V}$
- j) If readings are obtained which deviate by more than $\pm 3 \text{ dB}$, locate the source of the error and correct the deficiency prior to proceeding with step k).
- k) Establish the test setup according to figure 2-7.
- l) Adjust the power supply voltage to $28 \text{ V} \pm 1 \text{ V}$, and switch it on.
- m) Switch UUT on in armed mode (FU safe wheel to ARMED, FCU switch to ARMED).
- n) *Normal mode*
 Scan the measurement receiver over the frequency range 10 kHz to 10 MHz. The minimum sweep time is 100 seconds per decade. Use antennas and polarizations as listed in table 2-2. The bandwidth of the receiver shall be as follows:
 The bandwidth of the receiver shall be as follows:
 10 kHz - 250 kHz: B = 1 kHz (at -6 dB)
 250 kHz - 10 MHz: B = 10 kHz (at -6 dB).
- o) *Firing mode*
 (deleted)
- p) Repeat steps n) and o) with the signal obtained from the 28 V ground (negative) wire.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

- q) Switch the UUT off and disconnect the FU and the FCU from the test setup.
- r) Perform the functional test according to paragraph 3.1

Test evaluation: Conducted emissions on power leads shall not exceed the values shown on figure 2-8.

Data Sheets: Use Data sheets as per Appendix 4.
Data plots shall be appended to the data sheets.

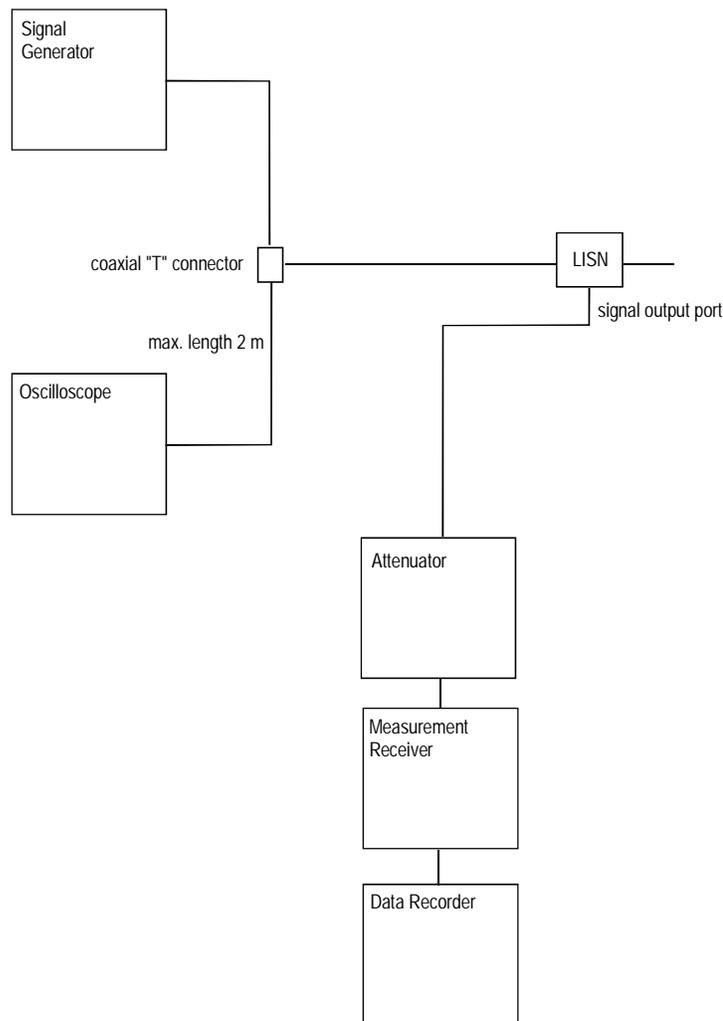


Figure 2. -6. Conducted emissions calibration setup.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

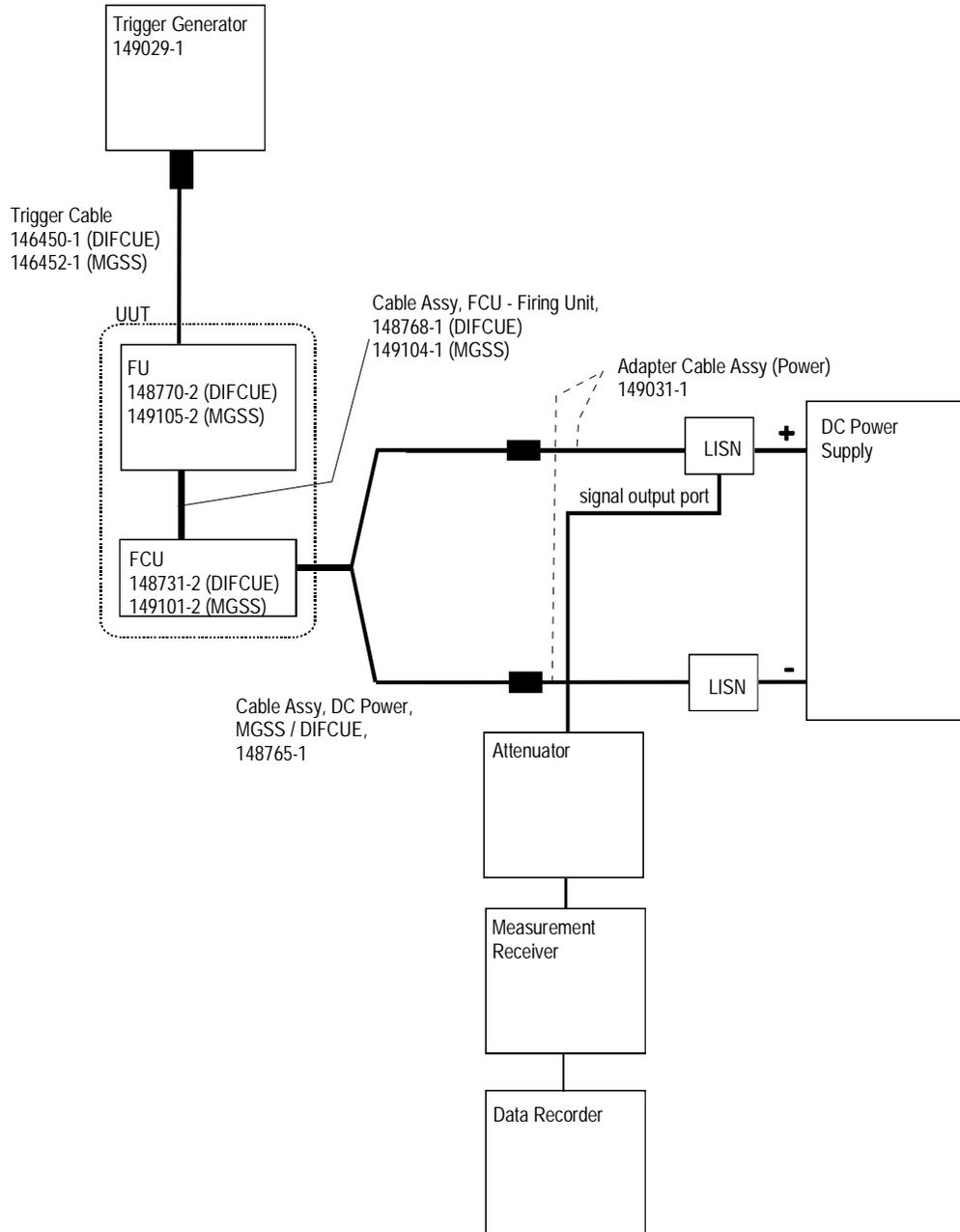


Figure 2. -7. Conducted emissions test setup.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

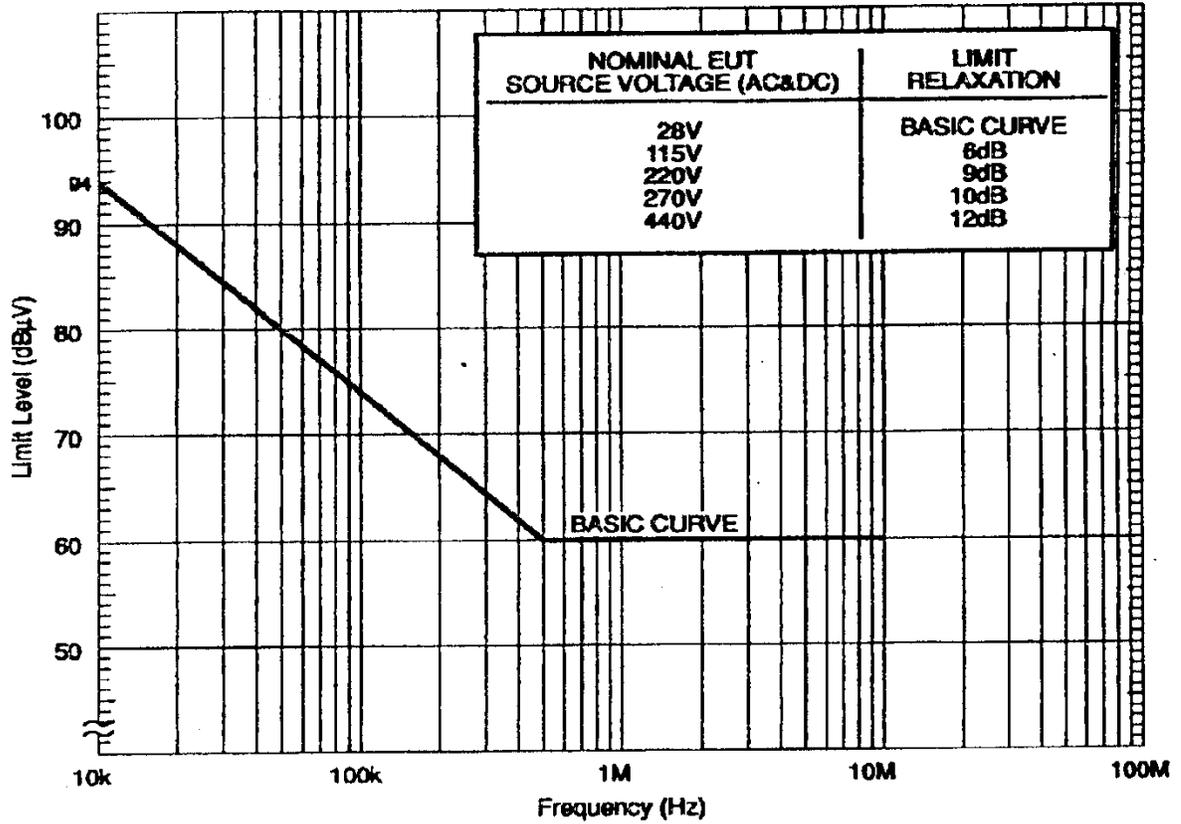


Figure 2. -8. Conducted emissions test limits.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

2. 3. Radiated Susceptibility Test

Test reference:	Specification paragraph [1] 4.7.2.6.11.1 Specification paragraph [2] 4.7.2.6.11.1
Test method:	According to MIL-STD-462, method RS103 and MIL-STD-461 RS103.
Test samples:	DIFCUE (FU 148770-2 and FCU 148731-2), MGSS (FU 149105-2 and FCU 149101-2), Trigger cable 146 450-1 (DIFCUE), 146 452-1 (MGSS) Interconnection cable 148768-1 (305 390) (DIFCUE), 149104-1 (305 120) (MGSS) Power cable 148765-1 (305 370)
Test duration:	3 days
Test conditions:	UUT powered up, equipped with inert pyrotechnics with optical indicators. Ambient temperature and humidity conditions.
Test circuit:	See figure 2-9.
Test setup:	See figure 2-1.
Test equipment:	See table 2-4.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Table 2. -4.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC supply 28 V / 7.5 A (or variable output)	1	EA 7030-200	N/A	Eltronix
2	E-field sensor	1	524-C	N/A	IFI
3	Field intensity meter 10 kHz - 40 GHz	1	EFS-5	N/A	IFI
4	Signal generator 1 Hz - 13 MHz	1	3312A	N/A	HP
5	Signal generator 10 MHz - 60 GHz	1	8673D	N/A	HP
6	Power amplifier, 10 kHz -13 MHz	1	2100L	N/A	ENI
7	Power amplifier, 1.5 MHz - 400 MHz	1	5100L	N/A	ENI
8	Power amplifier, 400 MHz - 700 MHz	1	4070-52	N/A	MPD
9	Power amplifier, 700 MHz - 1 GHz	1	7010-52	N/A	MPD
10	Power amplifier, 1 GHz - 2 GHz	1	1277-H-09	N/A	Hughes
11	Power amplifier, 2 GHz - 4 GHz	1	1277-H-01	N/A	Hughes
12	Power amplifier, 4 GHz - 8 GHz	1	8020H	N/A	Hughes
13	Power amplifier, 8 GHz - 12 GHz	1	1277-H-03	N/A	Hughes
14	Power amplifier, 12 GHz - 18 GHz	1	1277H	N/A	Hughes
15	Antenna, parallel plate 10 kHz - 200 MHz	1	EFG-3	N/A	IFI
16	Antenna, log periodic, 150 MHz - 1000 MHz	1	AT1000	N/A	AR
17	Antenna, double ridge horn, 1 GHz - 18 GHz	1	3115	N/A	EMCO
18	LISN 10 kHz - 50 MHz	2	9233-50-TS- 50-N	N/A	Solar
19	Ground plane, copper, 250 cm x 80 cm min.	1	N/A	N/A	EMCC
20					
21	Trigger generator	1	N/A	149029-1 (EP4-104-97)	Diehl
22	Trigger cable, DIFCUE	1	N/A	146450-1	CDS
23	Trigger cable, MGSS	1	N/A	146452-1	CDS
24	Pyrotechnic, inert, with optical indicator, DIFCUE	10	N/A	149041-1	Diehl
25	Pyrotechnic, inert, with optical indicator, MGSS	10	N/A	149041-2	Diehl

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Test procedure:

- a) Verify Acceptance Test Report is complete.
- b) Establish the system setup so that the Functional Test can be conducted (see figure 3-1 for DIFCUE, figure 3-2 for MGSS).
- c) Perform the functional test according to paragraph 3.1
- d) Switch UUT to safe mode.
- e) Load the Firing Unit with 10 inert pyrotechnics with optical indicator as shown in figure 3-1 (DIFCUE) and figure 3-2 (MGSS).
- f) Establish the test setup according to figure 2-9.
- g) Adjust the power supply voltage to $28\text{ V} \pm 1\text{ V}$, and switch it on.
- h) Switch UUT to safe mode.
- i) Record the amplitude shown on the electric field sensor display unit due to UUT ambient. Reposition the sensor, as necessary, until this level is $< 10\%$ of the applicable field strength to be used for testing (see table 2-2).
- j) Switch UUT to armed mode (FU safe wheel to ARMED, FCU switch to ARMED).
- k) Set the signal generator to 1 kHz pulse modulation, 50% duty cycle, and using appropriate amplifier and transmit antenna, establish an electric field at the test start frequency.
- l) Gradually increase the electric field level until it reaches the applicable limit shown in table 2-5.
- m) Scan the required frequency ranges in accordance with table 2-5.
Initiate the trigger signal to activate an ignition of a pyrotechnic approximately every ten seconds. Verify activation of pyrotechnic by the optical indicator. The indicator shall momentarily light up when the pyrotechnic is activated.
After activation of the highest loaded position, the FCU must be switched to safe mode, then back to armed mode, to restart the system. Stop scanning while resetting the system.
Monitor UUT performance for susceptible effects.
The display of the FCU shall count down from 10 (after reset) to 0 by one round with every activation.
No error codes shall be displayed.
The minimum sweep time is 300 seconds per decade.
- n) If susceptibility is noted, determine the level and frequency at which the undesirable response is no longer present.
- o) Switch the UUT off and disconnect the FU and the FCU from the test setup.
- p) Perform the functional test according to paragraph 3.1

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

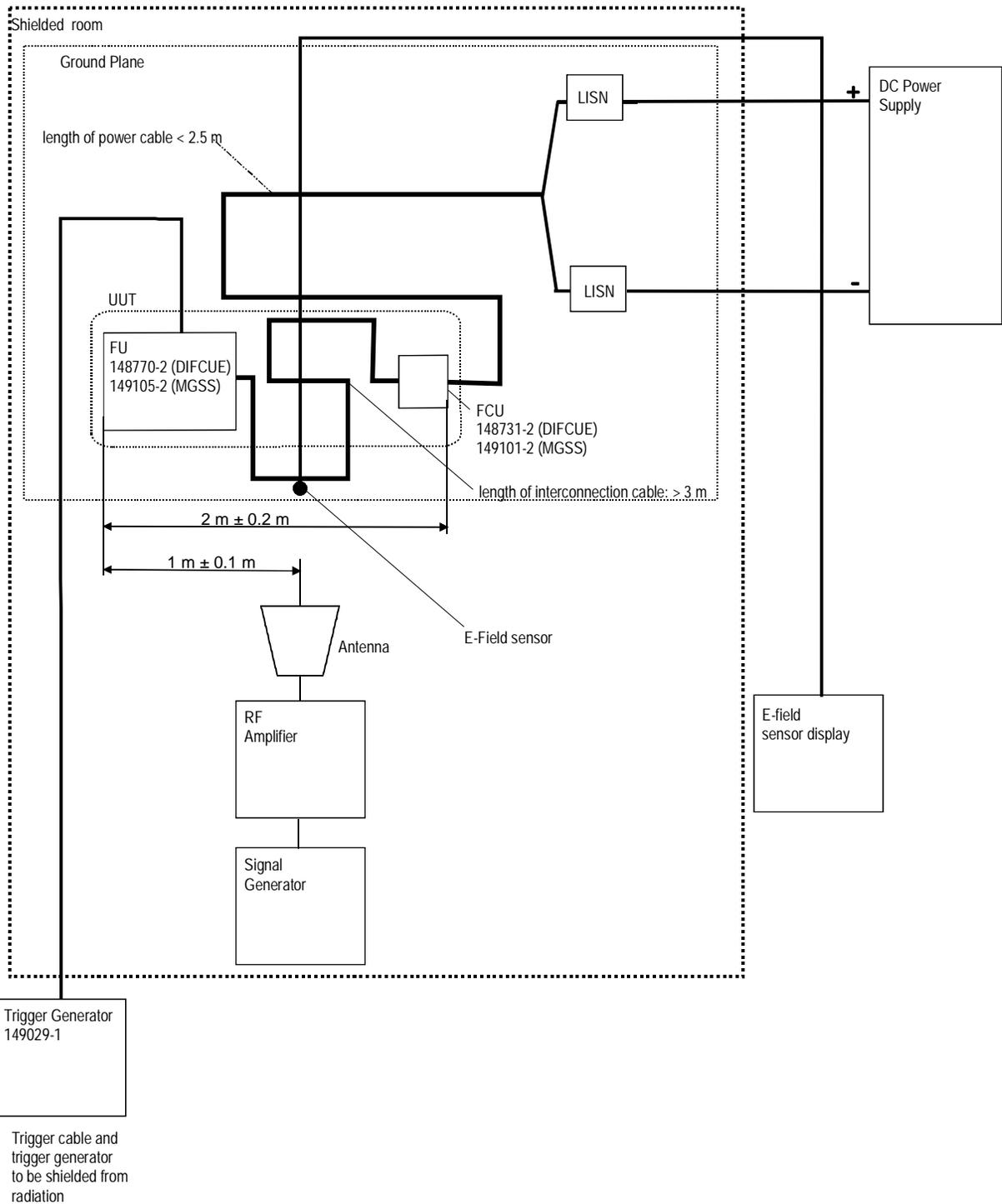
Test evaluation: There shall be no degradation in performance during and after exposure of the UUT to electric field levels listed in table 2-5.

Data Sheets: Use Data sheets as per Appendix 4.
Record susceptibility frequencies and threshold levels in appropriate tables (see paragraph 4, appendix).
All test data, including these tables, must be appended to the Test Report.

Table 2. -5. Radiated susceptibility test levels.

Frequency	Polarization	Field strength level [V / m]
10 kHz - 2 MHz	vertical	20
2 MHz - 30 MHz	vertical	50
30 MHz - 1 GHz	vertical and horizontal	50
1 GHz - 18 GHz	vertical and horizontal	50

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-



Notes:

- Trigger generator and trigger cable shall not be exposed to radiation.
- The test has to be established in a shielded room.
- At least 2 meters of the interconnecting cable shall be run in parallel to the front boundary of the test setup.

Figure 2. -9. Radiated susceptibility test setup.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

2. 4. Conducted Susceptibility Test

- Test reference:** Specification paragraph [1] 4.7.2.6.11.3
Specification paragraph [2] 4.7.2.6.11.3
- Test method:** According to MIL-STD-462, method CS101, power leads, and MIL-STD-461 CS101.
- Test samples:** DIFCUE (FU 148770-2 and FCU 148731-2),
MGSS (FU 149105-2 and FCU 149101-2),
Trigger cable 146 450-1 (DIFCUE), 146 452-1 (MGSS)
Interconnection cable 148768-1 (305 390) (DIFCUE), 149104-1 (305 120) (MGSS)
Power cable 148765-1 (305 370)
- Test duration:** 1 day
- Test conditions:** UUT powered up, equipped with inert pyrotechnics with optical indicators.
Ambient temperature and humidity conditions.
- Test circuit:** See figure 2-11.
- Test setup:** See figure 2-1.
- Test equipment:** See table 2-6.

Table 2. -6.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC supply 28 V / 7.5 A (or variable output)	1	EA 7030-200	N/A	Eltronix
2	Oscilloscope 500 MHz bandwidth	1	TDS-520	N/A	Tektronix
3	AF Amplifier 10 Hz - 500 kHz	1	6552-1A	N/A	Solar
4	Oscillator	1	512	N/A	Waveforms
5	Isolation transformer 30 Hz - 250 kHz	1	6220-1A	N/A	Solar
6	LISN 10 kHz - 50 MHz	2	9233-50-TS-50-N	N/A	Solar
7	Resistor 0.5 Ohm	1	N/A	N/A	NTS
8	Capacitor 10 µF	1	GF4150-2	N/A	Genisco
9	Ground plane, copper, 250 cm x 80 cm min.	1	N/A	N/A	EMCC
10	Trigger generator	1	N/A	149029-1 (EP4-104-97)	Diehl
11	Trigger cable, DIFCUE	1	N/A	146450-1	CDS
12	Trigger cable, MGSS	1	N/A	146452-1	CDS
13	Pyrotechnic, inert, with optical indicator, DIFCUE	10	N/A	149041-1	Diehl
14	Pyrotechnic, inert, with optical indicator, MGSS	10	N/A	149041-2	Diehl

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Test procedure:

- a) Verify Acceptance Test Report is complete.
- b) Establish the system setup so that the Functional Test can be conducted (see figure 3-1 for DIFCUE, figure 3-2 for MGSS).
- c) Perform the functional test according to paragraph 3.1
- d) Switch UUT to safe mode.
- e) Load the Firing Unit with 10 inert pyrotechnics with optical indicator as shown in figure 3-1 (DIFCUE) and figure 3-2 (MGSS).
- f) Establish the calibration setup according to figure 2-10.
- g) Set the signal generator to the lowest test frequency (30 Hz).
- h) Increase the applied signal until the oscilloscope indicates the voltage level corresponding to required power level specified in figure 2-12.
Verify the output waveform is sinusoidal.
- i) Record the settings of the signal generator and the power amplifier.
- j) Scan the required frequency range for testing and record the signal source settings needed to maintain the required power level.
Records to be made at all frequencies f_0 with $f_0 = \{30 \text{ Hz}; 60 \text{ Hz}; 100 \text{ Hz}; 300 \text{ Hz}; 600 \text{ Hz}; 1000 \text{ Hz}; 3000 \text{ Hz}; 6000 \text{ Hz}; 10 \text{ kHz}; 30 \text{ kHz}; 50 \text{ kHz}\}$.
- k) Establish the test setup according to figure 2-11.
- l) Adjust the power supply voltage to $28 \text{ V} \pm 1 \text{ V}$, and switch it on.
- m) Switch UUT on in armed mode (FU safe wheel in ARMED mode, FCU switch in ARMED mode).
- n) Set the signal generator to the lowest test frequency (30 Hz).
Increase the signal level until the required power level according to figure 2-12 or the value determined in step j) is reached, whatever occurs first.
- o) While maintaining the power level, scan through the frequency range at a rate not greater than $(0.02 \times f_0) / \text{sec}$ until the next frequency as listed in step j) is reached.
Observe FCU indication.
The display shall indicate the number of rounds available (10).
No error codes shall be displayed.
Initiate a BIT.
Initiate a trigger to activate a pyrotechnic.
Verify activation of pyrotechnic by the optical indicator. The indicator shall momentarily light up when the pyrotechnic is activated.
After activation of the highest loaded position, the FCU must be switched to safe mode, then back to armed mode, to restart the system.
The normal operation of the UUT shall not be affected.
If a susceptible response of the UUT is noted, determine the level and frequency at which the undesirable response is no longer present.
- p) Adjust the signal level until the required power level according to figure 2-12 or the value determined in step j) is reached, whatever occurs first.
- q) Repeat steps o) and p) until the upper frequency limit (50 kHz) is reached.
- r) Change the position of the coupling transformer from one power lead to the other power lead.
- s) Repeat steps n) to q) with the signal induced into the other power lead.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

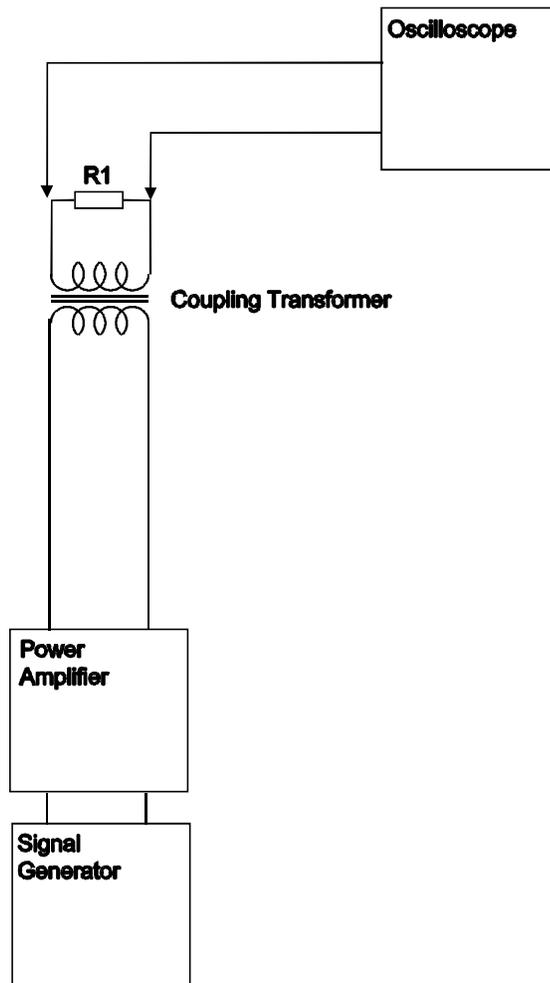
- t) Switch the UUT off and disconnect the FU and the FCU from the test setup.
- u) Perform the functional test according to paragraph 3.1

Test evaluation:

UUT shall perform normally during and following the test.
Any inadvertent ignition of a round or any malfunction shall constitute a failure.
Record susceptibility frequencies and threshold levels in appropriate tables.
All test data, including these tables, must be appended to the Test Report.

Data Sheets:

Use Data sheets as per Appendix 4.



R1 = 0.5 Ω

Figure 2. -10. Calibration circuit for conducted susceptibility test.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

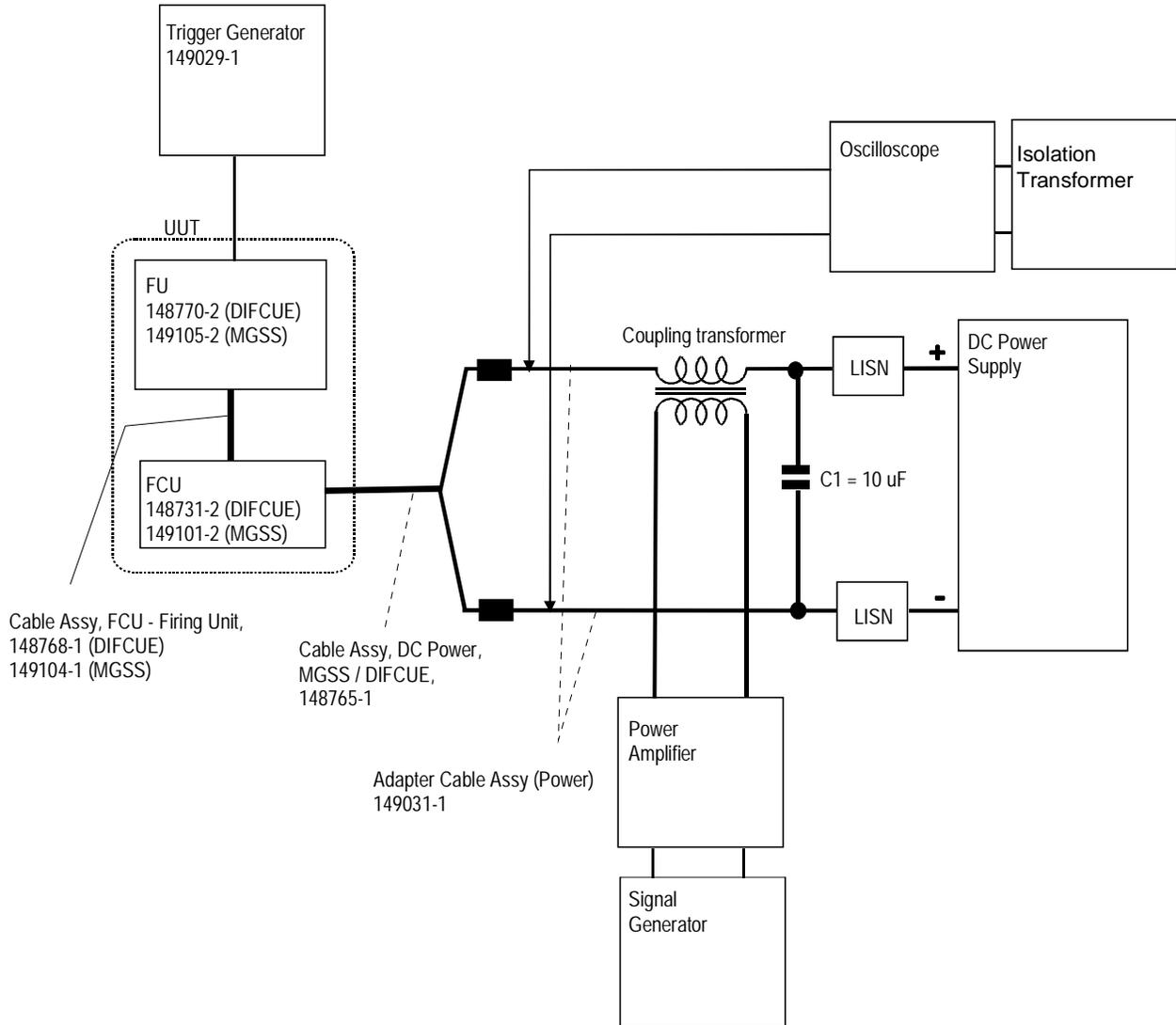
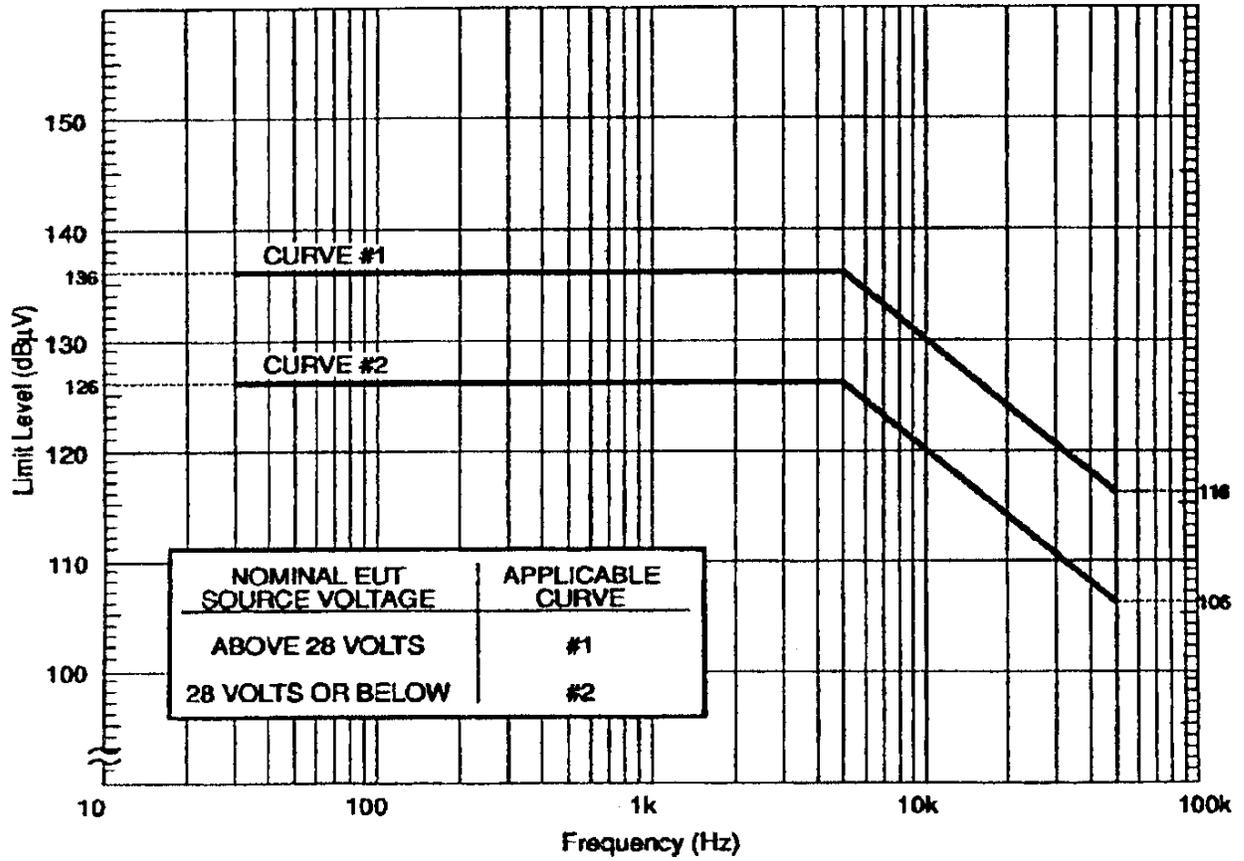


Figure 2. -11. Test circuit for conducted susceptibility test.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-



Applicable curve is #2.

Figure 2. -12. Conducted susceptibility test limits.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

2. 5. Personnel Electrostatic Discharge Test

The keyless MGSS/DIFCUE was not subject to repeat ESD Test per ARDEC recommendation. Testing was completed on previous keyed systems. See EMI Test Report SDRL A019-001.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

2. 6. Voltage Spikes and Surges Test

- Test reference:** Specification paragraph [1] 4.7.2.1.6
Specification paragraph [2] 4.7.2.1.6
- Test method:** According to MIL-STD-1275, paragraph 5.1 Fault free condition.
- Test samples:** DIFCUE (FU 148770-2 and FCU 148731-2),
MGSS (FU 149105-2 and FCU 149101-2),
Trigger cable 146 450-1 (DIFCUE), 146 452-1 (MGSS)
Interconnection cable 148768-1 (305 390) (DIFCUE), 149104-1 (305 120) (MGSS)
Power cable 148765-1 (305 370)
- Test duration:** 3 days
- Test conditions:** UUT powered up, equipped with inert pyrotechnics with optical indicators.
Ambient temperature and humidity conditions.
- Test circuit:** See figure 2-14.
- Test setup:** See figure 2-1.
- Test equipment:** See table 2-8.

Table 2. -7.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC supply 28 V / 7.5 A (or variable output)	1	EA 7030-200	N/A	Eltronix
2	Oscilloscope	1	54502A	N/A	HP
3	Function generator	1	1011.2075.6	N/A	Rohde & Schwarz
4	High voltage supply	1	NU1250B	N/A	Nucletron
5	Resistor 300 Ω / 3 W	1	N/A	N/A	Vitrohm
6	DC power supply, with modulator	1	GS10/80	N/A	Spitzenberger & Spiess
7	LISN 50 Ω / 5 μ H	2	5/50 LISN	N/A	EMCC
8	Ground plane, copper, 250 cm x 80 cm min.	1	N/A	N/A	EMCC
9	Trigger generator	1	N/A	149029-1 (EP4-104-97)	Diehl
10	Trigger cable, DIFCUE	1	N/A	146450-1	CDS
11	Trigger cable, MGSS	1	N/A	146452-1	CDS
12	Pyrotechnic, inert, with optical indicator, DIFCUE	10	N/A	149041-1	Diehl
13	Pyrotechnic, inert, with optical indicator, MGSS	10	N/A	149041-2	Diehl

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Test procedure:

- a) Verify Acceptance Test Report is complete.
- b) Establish the system setup so that the Functional Test can be conducted (see figure 3-1 for DIFCUE, figure 3-2 for MGSS).
- c) Perform the functional test according to paragraph 3.1
- d) Switch UUT to safe mode.
- e) Load the Firing Unit with 10 inert pyrotechnics with optical indicator as shown in figure 3-1 (DIFCUE) and figure 3-2 (MGSS).

Spike Test

- f) Establish the test setup according to figure 2-14.
Instead of the UUT, use a 300 Ohm resistor as a electrical load.
- g) Adjust the power supply voltage to $28\text{ V} \pm 1\text{ V}$, and turn it on.
- h) Adjust the high voltage supply to $250\text{ V} \pm 10\text{ V}$.
- i) Close the switch in figure 2-14 for approximately one second to charge capacitor C1, then open the switch again.
- j) Record the spike waveform and compare it to the requirement according to figure 2-15.
- k) If the waveform is appropriate, proceed with step l). Otherwise, the setup has to be modified in order to produce spikes as required.
- l) Establish the test setup according to figure 2-14.
- m) Switch UUT on in armed mode (FU safe wheel to ARMED, FCU switch to ARMED).
- n) Apply 50 spike pulses to the UUT.
Observe FCU indication.
The display shall indicate the number of rounds available (10).
No error codes shall be displayed.
Initiate a BIT.
The normal operation of the UUT shall not be affected.
- o) Reverse the polarity of the high voltage supply and repeat step l).
- p) Switch all power supplies and the UUT off and disconnect from test setup.

Surge Test

- q) Establish the test setup according to figure 2-16.
Instead of the UUT, use a 300 Ohm resistor as a electric load.
- r) Adjust the power supply #1 voltage to $28\text{ V} \pm 1\text{ V}$.
- s) Adjust the power supply #2 voltage to $12\text{ V} \pm 1\text{ V}$.
- t) Adjust the function generator to produce single pulses, manually triggered, duration $50\text{ ms} \pm 5\text{ ms}$, output level sufficient to drive power supply control.
- u) Initiate the function generator to produce $+40\text{ V} / 50\text{ ms}$ surges as shown in figure 2-17.
- v) If the waveform is appropriate, proceed with step u). Otherwise, the setup has to be modified in order to produce voltage surges as required.
- w) Establish the test setup according to figure 2-16.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

- x) Switch UUT on in armed mode.
- y) Apply 5 times a 40 V transient to the UUT.
Observe FCU indication.
The display shall indicate the number of rounds available (10).
No error codes shall be displayed.
Initiate a BIT.
The normal operation of the UUT shall not be affected.
- z) Adjust the function generator to produce +18 V / 100 ms surges as shown in figure 2-17 and repeat step w).
- aa) Switch all power supplies and the UUT off and disconnect from test setup.
- bb) Perform the functional test according to paragraph 3.1

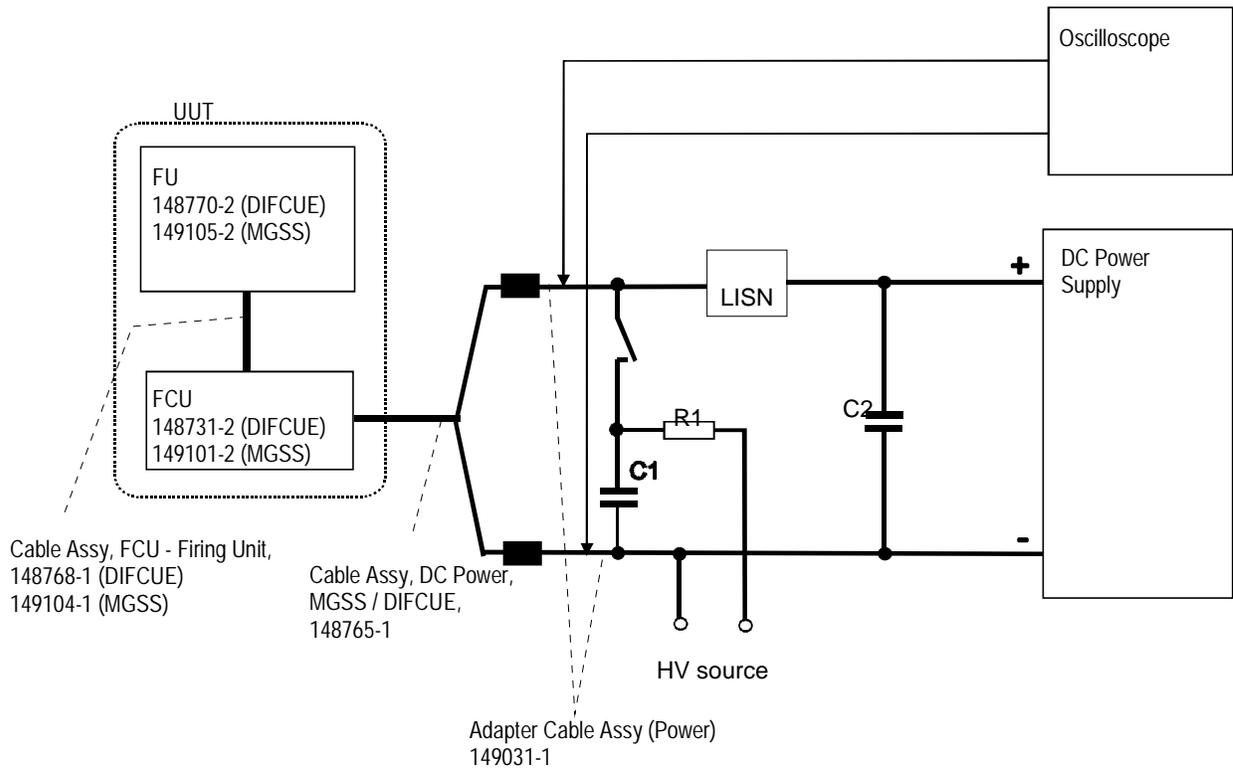
Test evaluation:

UUT shall perform normally during and following the test.
Any inadvertent ignition of a round shall constitute a failure.

Data Sheets:

Use Data sheets as per Appendix 4.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-



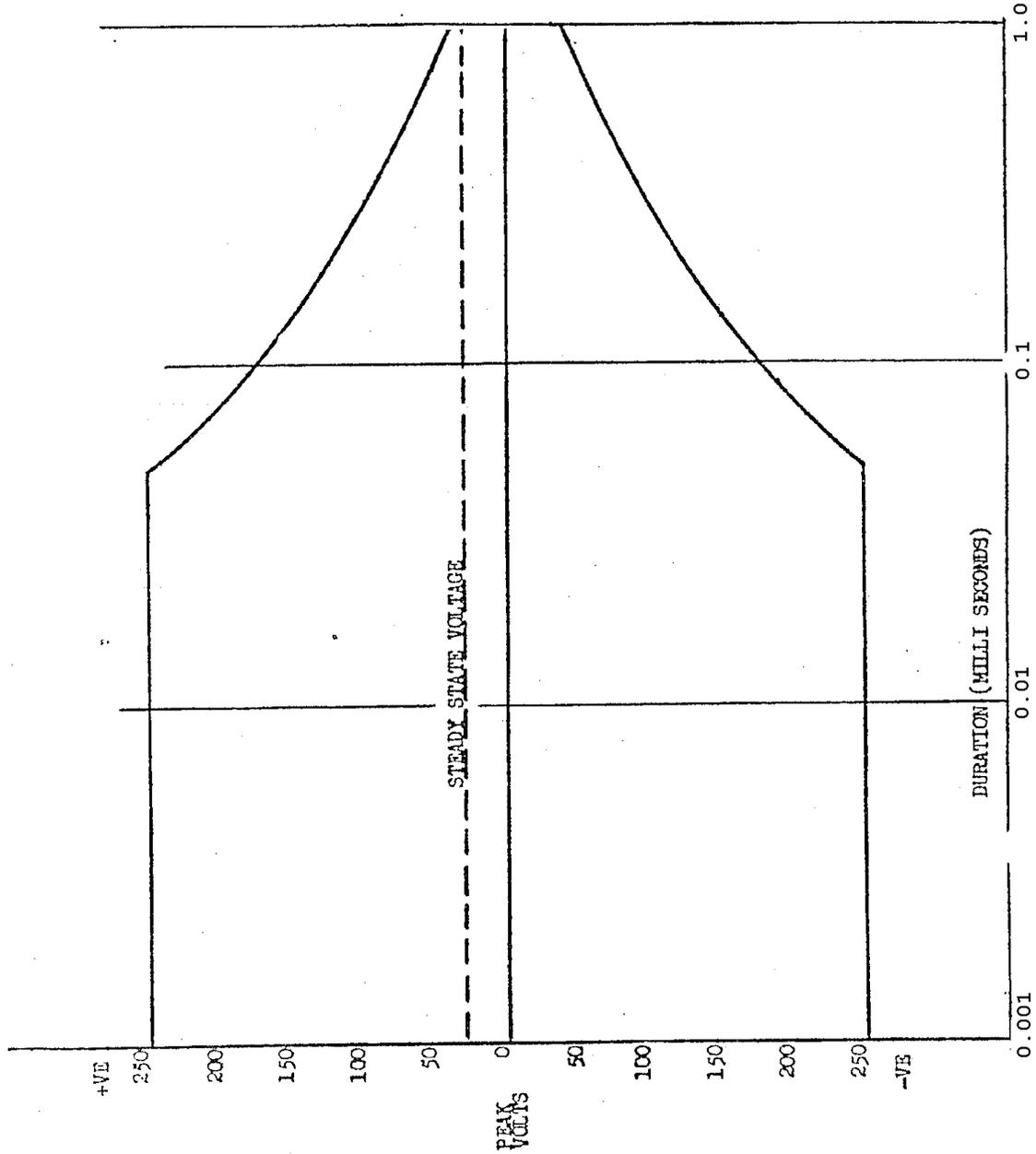
C1 = 0.1 μ F / 400 V
C2 = 10 μ F / 40 V
R1 = 100 k Ω / 0.5 W

Note:

The DC power supply, the high voltage supply and the oscilloscope shall be connected to line voltage each via an individual isolating transformer.

Figure 2. -13. Test setup for spikes test.

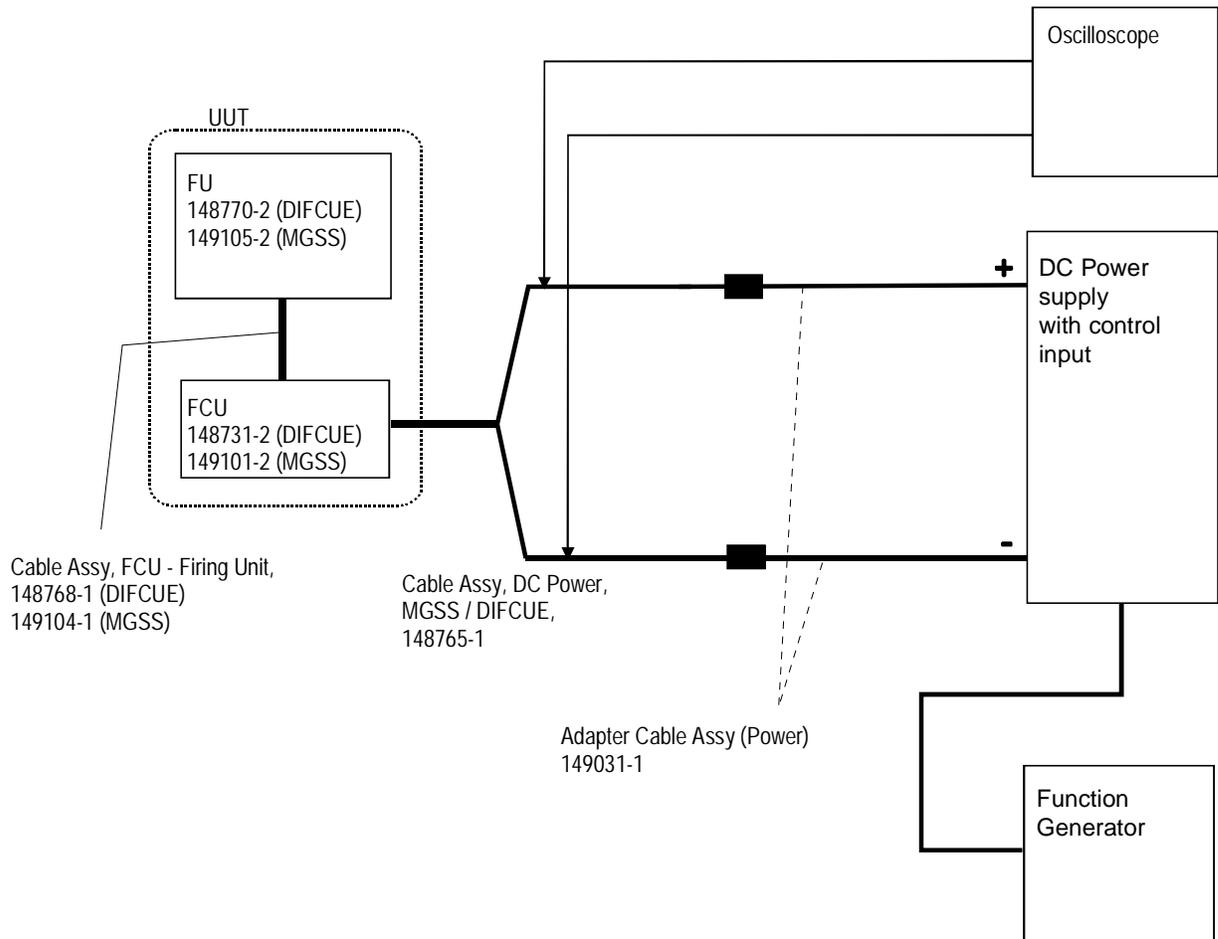
INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-



Note:
The spike recorded shall follow the waveform within a $\pm 10\%$ tolerance over the initial $50\ \mu\text{s}$ pulse.
Maximum spike energy 15 Millijoules.

Figure 2. -14. Spike voltage envelopes.

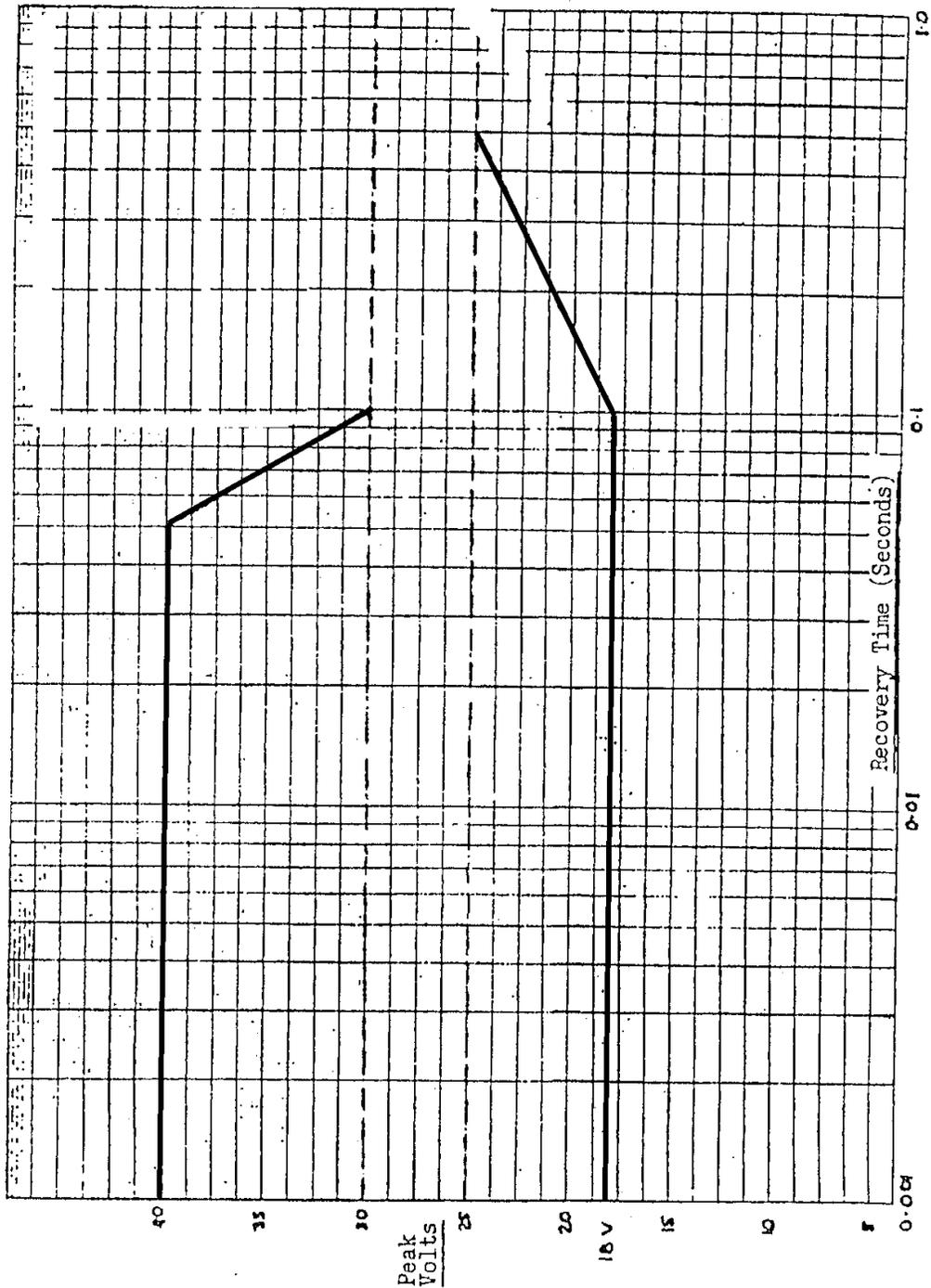
INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-



Note:
The DC power supplies and the oscilloscope shall be connected to line voltage each via an individual isolating transformer.

Figure 2. -15. Test setup for surge voltage test.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-



Note:

The voltage surge recorded shall follow the waveform within a $\pm 10\%$ tolerance over the initial 50 ms pulse.

Figure 2. -16. Surge voltage envelopes.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

2. 7. EMRH Test

The keyless MGSS/DIFCUE was not subject to repeat EMRH Test per ARDEC recommendation. Testing was completed on previous keyed systems. See EMI Test Report SDRL A019-001.

2. 8. EMRO Test

The keyless MGSS/DIFCUE was not subject to repeat EMRO Test per ARDEC recommendation. Testing was completed on previous keyed systems. See EMI Test Report SDRL A019-001.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

3. TESTS

3. 1. Functional Test

3. 1. 1. DIFCUE

The test equipment necessary is listed in table 3-1.

Table 3. -1. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Trigger Generator	1	N/A	149029-1 (EP4-104-97)	Diehl
3	Adapter Cable Assy (Power)	1	N/A	149031-1 (EP4-104-98A)	Diehl
4	Pyrotechnic, inert, with optical indicator, DIFCUE	10	N/A	149041-1	Diehl

3. 1. 1. 1. Step-By-Step procedure:

Initial conditions:

DC supply:
ON / OFF OFF

Test unit:
Firing Unit SAFE
Fire Control Unit SAFE

Step-by-step procedure:

- a) Load the FU with 10 inert pyrotechnics at positions 2, 8, 11, 13, 14, 17, 18, 20, 23, 29.
- b) Establish all cable connections between the Firing Unit and the trigger generator, between the Firing Unit and the Fire Control Unit and between the Fire Control Unit and the DC supply (fig. 3-1).
- c) Adjust the DC voltage to 28.0 V ± 2.0 V and switch the DC supply on.
- d) Rotate the safe wheel of the Firing Unit to ARMED.
- e) Switch the safe / arm key of the Fire Control Unit to ARMED.
- f) Ensure that the FCU indicates 10 available rounds.
- g) Press the push-button „Fired Rounds“ at the FCU and release it after reading the indication on the display.
Ensure that the FCU indicates 00 fired rounds.
- h) Press the push-button „Trigger“ at the trigger generator.
Observe the indicators of the inert pyrotechnics in the FU.
Ensure that the following sequence is performed with every activation:
 1. The whistle shall beep for approximately 2.5 s.
 2. The indicator of the next lower position (initially the highest position) lights up for approximately 100 ms.
 3. The FCU indication decrements by one round.
- i) Repeat step h) for a total of 10 times.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

- j) Observe the test until 10 rounds are fired.
- k) After the last round has been fired, read the indication of the FCU display.
Ensure that the FCU indicates 00 available rounds.
- l) Press the push-button „Fired Rounds“ at the FCU and release it after reading the indication on the display.
Ensure that the FCU indicates 10 fired rounds.
- m) Switch the DC supply off.
- n) Switch the FCU to safe mode, then switch the FU to safe mode.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

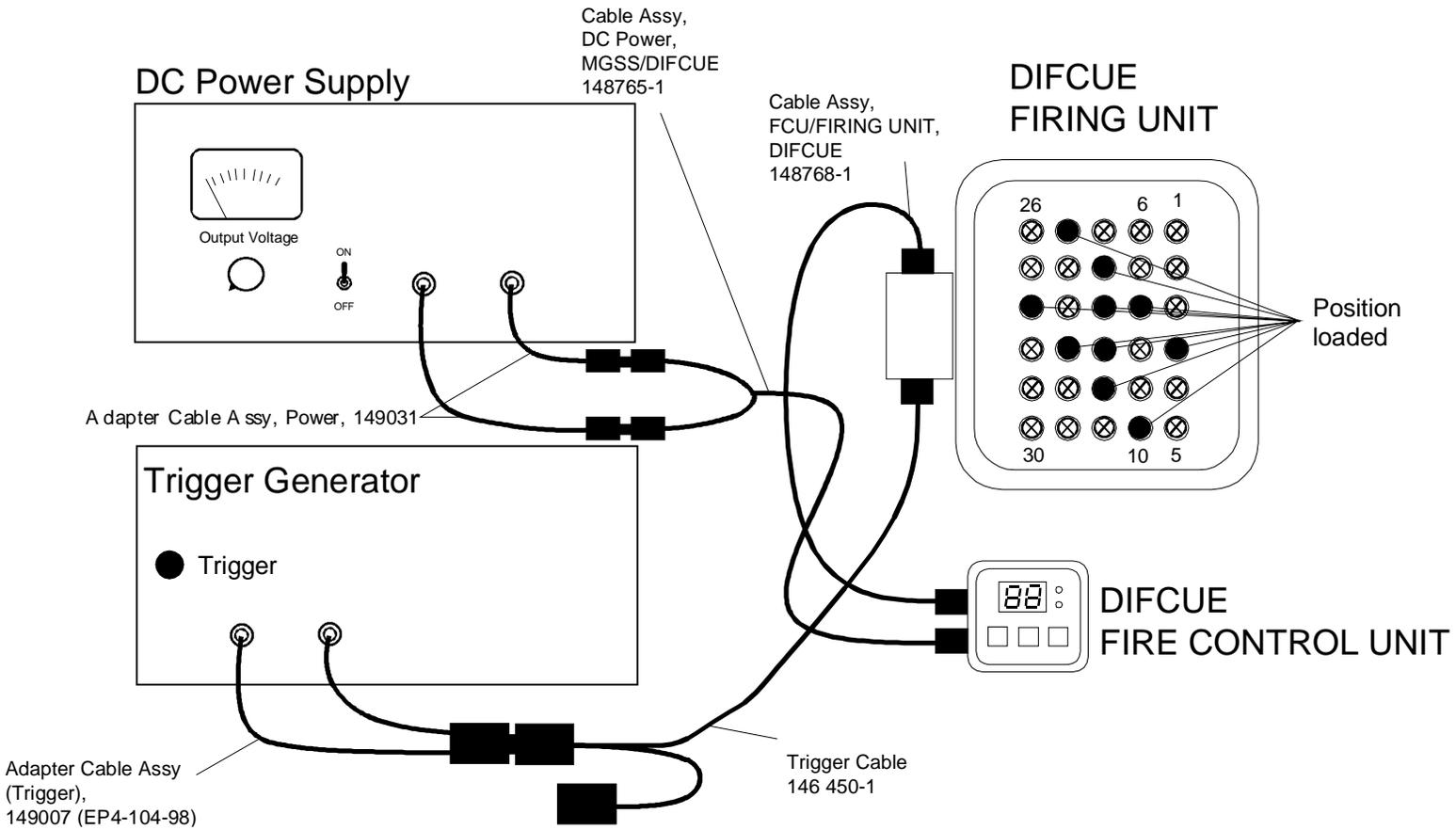


Figure 3. -1 DIFCUE functional test setup.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

3. 1. 2. MGSS

The test equipment necessary is listed in table 3-2.

Table 3. -1. Test equipment.

Item #	Function	Quantity req'd	Model Number	Part Number	Manufacturer
1	DC Power Supply	1	34G32R10	N/A	Gossen
2	Trigger Generator	1	N/A	149029-1 (EP4-104-97)	Diehl
4	Cable Assy (Power)	1	N/A	149031-1 (EP4-104-98A)	Diehl
5	Pyrotechnic, inert, with optical indicator, MGSS	10	N/A	149041-2	Diehl

3. 1. 2. 1. Step-By-Step procedure:

Initial conditions:

DC supply:
ON / OFF OFF
Test unit:
Firing Unit SAFE
Fire Control Unit SAFE

Step-by-step procedure:

- a) Load the FU with 10 inert pyrotechnics at positions 3, 10, 17, 24, 25, 32, 39, 46, 53, 60.
- b) Establish all cable connections between the Firing Unit and the trigger generator, between the Firing Unit and the Fire Control Unit and between the Fire Control Unit and the DC supply (fig. 3-2).
- c) Adjust the DC voltage to 28.0 V ± 2.0 V and switch the DC supply on.
- d) Rotate the safe wheel of the Firing Unit to ARMED.
- e) Switch the safe / arm key of the Fire Control Unit to ARMED.
- f) Ensure that the FCU indicates 10 available rounds.
- g) Press the push-button „Fired Rounds“ at the FCU and release it after reading the indication on the display.
Ensure that the FCU indicates 00 fired rounds.
- h) Press the push-button „Trigger“ at the trigger generator.
Observe the indicators of the inert pyrotechnics in the FU.
Ensure that the following sequence is performed with every activation:
 1. The indicator of the next lower position (initially the highest position) lights up for approximately 100 ms.
 2. The FCU indication decrements by one round.
- i) Repeat step h) for a total of 10 times.
- j) Observe the test until all 10 rounds are fired.
- k) After the last round has been fired, read the indication of the FCU display.
Ensure that the FCU indicates 00 available rounds.
- l) Press the push-button „Fired Rounds“ at the FCU and release it after reading the indication on the display.
Ensure that the FCU indicates 10 fired rounds.
- m) Switch the DC supply off.
- n) Switch the FCU to safe mode, then switch the FU to safe mode.

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

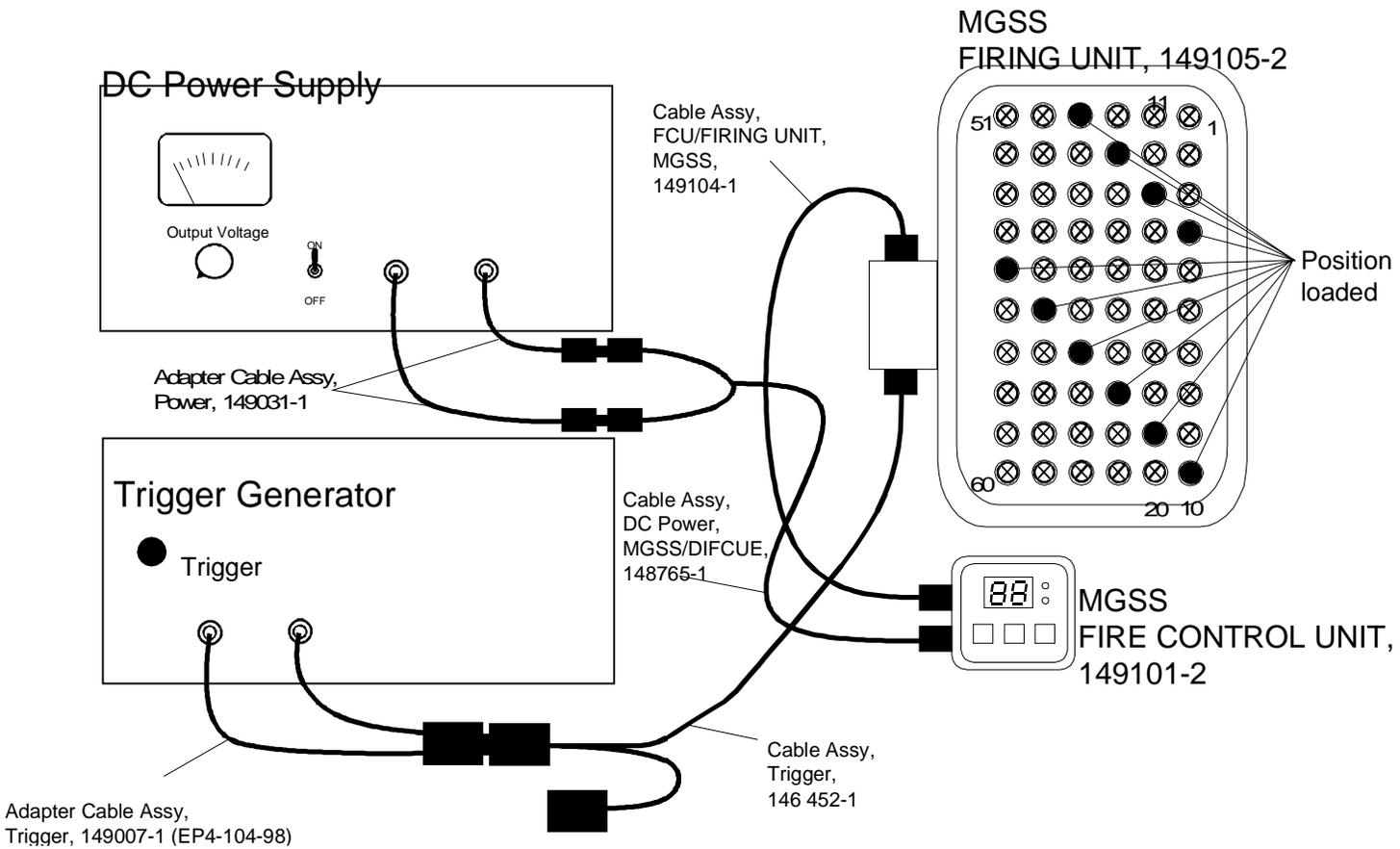


Figure 3. -2 MGSS functional test setup

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

4. APPENDIX

Data Sheets

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Qualification Test Report

DWG No.: 149105-2,149101-2,149104-1,148765-1,148770-2,148731-2,148768-1	AMENDT:
--	---------

To be used in conjunction with EMI Test Procedure Doc. 9718801, Issue 1.2, Index -.

<b style="font-size: 1.2em;">EMI Test Procedure	<b style="font-size: 1.2em;">DIFCUE
---	---

Test Procedure Paragraph	Test Description	Test Result	Remarks

Date of the test:

Performed:

Witnessed:

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Qualification Test Report

DWG No.: 149105-2,149101-2,149104-1,148765-1,148770-2,148731-2,148768-1	AMENDT:
--	---------

To be used in conjunction with EMI Test Procedure Doc. 9718801, Issue 1.2, Index -.

<b style="font-size: 1.2em;">EMI Test Procedure	<b style="font-size: 1.2em;">MGSS
---	---------------------------------------

Test Procedure Paragraph	Test Description	Test Result	Remarks

Date of the test:

Performed:

Witnessed:

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Qualification Test Report

DWG No.: 149105-2,149101-2,149104-1,148765-1,148770-2,148731-2,148768-1	AMENDT:
--	---------

To be used in conjunction with EMI Test Procedure Doc. 9718801, Issue 1.2, Index -.

<b style="font-size: 1.1em;">EMI Test Procedure (RE)	<b style="font-size: 1.1em;">MGSS
--	---------------------------------------

Test Procedure Paragraph	Field strength	Frequency	Remarks

Date of the test:

Performed:

Witnessed:

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-

Qualification Test Report

DWG No.: 149105-2,149101-2,149104-1,148765-1,148770-2,148731-2,148768-1	AMENDT:
--	---------

To be used in conjunction with EMI Test Procedure Doc. 9718801, Issue 1.2, Index -.

<b style="font-size: 1.2em;">EMI Test Procedure (RE)	<b style="font-size: 1.2em;">DIFCUE
--	---

Test Procedure Paragraph	Field strength	Frequency	Remarks

Date of the test:

Performed:

Witnessed:

INDEX	-				DOC.NO.	ISSUE	DATE	NAME
DATE	-				9718801	1.2	20.07.98	-